Design for Women's Participation in Inflatable Rescue Boat (IRB) Operation

Erogonomic Design Solutions to Gender Equity Issues in Surf Lifesaving New Zealand

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Contents

Attestation of Authorship

‘I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning. ‘

Date: 16/4/21

Signature:

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Abstract

Inflatable Rescue Boat (IRB) operation is an example of a sport that does not appear to have considered female participants in designing ergonomically appropriate equipment. Anecdotal evidence suggested that this design gap was a key factor affecting surf lifesaving (SLS) women's participation in IRB related activity. This project aimed to better understand what aspects of IRB operation require ergonomic design attention to better physically accommodate women involved or interested in IRB's.

This research applied HCD and Co-design inspired methods to provide SLS women with a voice and the opportunity to assist in designing product/s that are more ergonomically appropriate for their use. The findings contribute to a better understanding of the physical and mental challenges women who operate IRBs face throughout their experience in SLS. The research outcome includes a collaboratively designed product that ergonomically improves the experience of transporting an IRB outboard. The design outcome was as an ergonomic product that aids its users in lifting IRB outboards. It is hoped to provide women with greater confidence to operate and maintain IRBs successfully. The research highlighted aspects of IRB operation that require further investigation, setting a precedent and foundation in IRB operating equipment to cater to and support all the SLS user community ergonomically. The desired outcome of this work was a more significant consideration for the improvement of gender equity within IRB Operation (an assumed, male-dominant SLS activity) and, consequently, SLS culture more generally.

Positioning the Researcher

Over the course of my undergraduate and studentship opportunities/ studies, I have worked on numerous surf lifesaving and beach safety products individually and with Surf Lifesaving New Zealand (SLSNZ). These studies were conducted under the Good Health Design Studio's careful watch at Auckland University of Technology (AUT). The opportunities to work with these individuals and design these product/s have provided me with lasting design experience in conducting collaborative, human-centred design research in this space.

This research resulted in more than an industrial designed solution; it explored an issue in SLSNZ, blind to those involved and held mostly secret by those affected. This project aimed to unpack a gender equity issue within Inflatable Rescue Boat (IRB) operation. IRB operation is an SLS activity and an effective surf rescue method. I consider this project both an academic and a personal growth journey.

I entered this research not only as a 'surfer dude' (a stereotypical title given by my supervisor) but as a former Surf Lifeguard with patrolling experience. Numerous summers were spent watching over New Zealand's Northeast coastline with my family. My previous Surf Club involvement gave me the impression that IRB operation is a male-dominated surf rescue method and activity in SLS. As the study into this issue developed, I was surprised by the data I collected and how those affected by a gender equity issue were treated in Surf Lifesaving New Zealand's past and present. I saw an opportunity to design interventions on/for IRBs to engage the female community in this exciting and necessary SLS qualification. Using tacit knowledge as motivation and a footing in the subject, I aimed to produce ergonomic interventions with women experienced and interested in IRB operation. My goal was to facilitate both existing and upcoming women participating in IRB operation through design and promote gender equity in the SLS activity/ qualification.

Contextual Review

What is SLSNZ?

SLSNZ is a charitable association that represents 74 Surf Life Saving Clubs across New Zealand (Surf Lifesaving New Zealand, 2021). 4500 volunteer Surf Lifeguards patrol these beaches (over 80 locations) through the summertime (Surf Lifesaving New Zealand, 2021).

Surf Lifesaving as a service was introduced to New Zealand in 1906 and is considered "one of the best imports we have ever had from Australia" (Surf Lifesaving New Zealand, 2020). The first clubs were formed in 1910 at Lyall Bay (Wellington) and New Brighton (Christchurch) after local beach visitors were drowning unnecessarily along New Zealand coastlines (Surf Lifesaving New Zealand, 2020). Unlike Australia, New Zealand beaches were susceptible to unpredictable, roaring surf and dangerous conditions. In the early twentieth century, the sea claimed many lives (Harvey, 2009).

At this time, the surf rescue equipment consisted of 'reel and lines', a piece of surf rescue equipment that was originally made in Australia for their SLS clubs (New Zealand Herald, 2020). The reel and line was used by a group of lifeguards.

One guard would be responsible for wearing the belt (attached to the line on a reel) and swimming out to the distressed patient (New Zealand Herald, 2020). The team on the shoreline would reel the beltman and patient into shore once the beltman has reached and secured the patient (New Zealand Herald, 2020).

Sixty years later, there was a major change of surf rescue process and equipment (Surf Lifesaving New Zealand, 2020). Surf fins, neoprene rescue tubes, rubber rescue crafts, motors, jet boats and helicopters became accessible in surf rescue situations, revolutionising surf lifesaving (Surf Lifesaving New Zealand, 2020). The shift professionalised SLS and would shorten rescue times drastically (Harvey, 2009).

Harvey (2009) states in his book 'Between the Flags: 100 Years of Surf Life Saving in New Zealand' that "Surf Lifesaving Clubs broke down social barriers and established comradeship between strangers. All members were treated equally, no matter their background". Their only requirement was the ability to travel through the waves (Harvey, 2009). This egalitarian mentality has persisted to this day (Harvey, 2009). Women, on the other hand, had to fight for equality (Harvey, 2009).

Figure 1. Surf Lifesaving New Zealand. (2020) Reels Life-Saving Carnival at Bethels

What is SLSNZ? - Womens Participation in SLSNZ.

Harvey (2009) provides a historical account of how women have battled for equality in the sport. Though women were initially allowed to join clubs as full members, the heroic bronzed and tanned man became the idealised symbol of the beach in the 1930s. (Harvey, 2009). Before World War II, men saw surf lifesaving as a male-only sport (Harvey, 2009). Many members believed women lacked the physical abilities for such a strenuous activity (Harvey, 2009). They were seen as not strong enough to perform surf rescues or swim competitively in the surf, and if done so, endangering their own lives and the lives of others (Harvey, 2009). Female participation was believed to taint the public image of surf lifesaving (Harvey, 2009). The involvement and appearance of women in SLS disrupted the 'bronzed male hero' persona formed by existing lifeguards (Harvey, 2009). The male dominance of the industry affected the public's perception of females patrolling and the female community's motivation to participate in Surf Lifesaving (Harvey, 2009).

During World War II, men were conscripted to fight on the European fronts and were forced to abandon their coastal patrol posts (Harvey, 2009). In this time, women took the opportunity to step into previously male-dominated roles (Harvey, 2009). Through this, women repeatedly made known they were adequate lifeguards with reports of numerous successful mass rescues across New Zealand. The male members did not extend this appreciation on their return from war (Wade, 2020). The roles of SLS women were momentary when the men returned from war to a result where they were relegated to fundraising duties and refreshment baking/making (Harvey, 2009).

Wade (2020) informs that historically, some of the women members who were prominent in the 1940s and 50s recall that the men did not want women around their clubs. Many women left to form 'ladies' lifesaving clubs, often neighbouring their former colleagues' clubhouses (Wade, 2020). The baby boom years and social expectations of the 1950s saw women leave surf clubs after they became married (Wade, 2020). Women's clubs eventually joined with men's clubs, and by the 1970s, a demand to recognise women as full members of society had intensified (Wade, 2020). Women now work alongside men on surf patrols around New Zealand as equals and have access to all that SLSNZ has to deliver (as of 2020) (Harvey, 2009).

Figure 2. Surf Lifesaving New Zealand. (2020) A line-up of surf beauties from St Clair 1946

IRB OPERATION - A Historical Perspective

Since it first took to the water in 1969, the Aussie innovation, coined the “rubber duck”, has been responsible for saving around 200,000 lives and is in service in at least 50 countries as a surf rescue craft (Surf Lifesaving New South Wales, 2019).

Surf Lifesaving New South Wales (2019) documents Warren Mitchell’s story.

“A young lifesaver from Avalon Beach and his venture overseas with a bunch of mates to obtain jobs as lifeguards in the UK. After a terrible drowning at Cornwall in the United Kingdom where he was on duty, Warren began thinking about how an inflatable boat could work to negotiate the break to reach patients more quickly than the line and reel method, which was possibly responsible for the deaths of more people than were saved”.

Mitchell teamed up with the Dunlop Company to develop the first Inflatable Rescue Boat (Avsec, 2013). The boat was powered by a 20-horsepower outboard motor and weighed four metres in length, setting the standard for the IRB we use today (Avsec, 2013). IRB’s were introduced to New Zealand SLS clubs as a potential replacement option for several jet boats used in various parts of New Zealand (Surf Life Saving New Zealand, 2018)

With the intention of finding a suitable craft for surf rescue, a variety of boats were tested by the Australian and New Zealand Surf Life Saving Association at Piha beach (Surf Life Saving New Zealand, 2018). The boats put to the test had to be rugged, compact, sturdy, comfortable for novice users, able to be launched and run by two people in waves up to 5 metres and need little maintenance (Arancia, 2018). The Piha trials aimed to put these boats through their paces in challenging west coast surf to find a boat that could be used by clubs all over New Zealand (Arancia, 2018). Piha is considered a popular surfing location (consistently large waves) with strong and often dangerous currents, a perfect environment to test these boats’ limitations (100% pure New Zealand, 2021). After many attempts by SLSNZ and those involved in the Piha trials to find a suitable craft out of the numerous offered, John Speight, an attendee of the trial day) agreed to develop an Inflatable Rescue Boat (IRB) specifically for Surf Life Saving use (Surf Life Saving New Zealand, 2018). The development of the IRB resulted in the formation of his company, Arancia.

Figure 3. Surf Lifesaving New Zealand. (n.d.) Jet Rescuer 1 CSLSA

According to the 2018 IRB manual, the prototype Arancia IRB was shipped to Piha SLSC in November 1978, and the IRB was involved in rescuing a swimmer washed up on the rocks just hours after its launch. In New Zealand, the IRB rapidly developed itself as an innovative and reliable front-line rescue tool for surf lifesaving (Inflatable Rescue Boat Training Manual, 2018).

Although the Arancia design has improved somewhat over time, it is still very similar to the original (Inflatable Rescue Boat Training Manual, 2018). Other manufacturers have sometimes supplied IRBs, but Arancia is the only current SLSNZ-approved IRB manufacturer (Inflatable Rescue Boat Training Manual, 2018). These boats can only be purchased by SLSNZ members (Inflatable Rescue Boat Training Manual, 2018). This is due to SLSNZ's relationship with John Speight and the lasting quality/ satisfaction of Arancia's design (Arancia, 2018).

A Johnson/Evinrude 25hp (horsepower) two-stroke outboard engine with a stainless-steel propeller and an aluminium/stainless propeller guard was the first outboard engine used on an IRB (Surf Life Saving New Zealand, 2018). Following that, Mariner and Yamaha 30hp engines were licenced, and the Mercury 30hp surf engine is now the engine of choice (Surf Life Saving New Zealand, 2018).

IRBs are often used for recreational, competitive purposes. IRB racing is a sub-activity in SLSNZ where clubs compete in performing the quickest rescue around a circuit. Long-distance races occur between beaches, competing for the fastest time and most effective surf navigation. IRBs are used as preventative water safety during carnivals and busy days at the beach. Lifeguards will stay out in the water watching over competitors and beach visitors past the shoreline (Surf Life Saving New Zealand, 2018).

SLSNZ is also the world pioneer in Inflatable Rescue Boat Operations (Surf Life Saving New Zealand, 2018). The IRB is involved in more than half of New Zealand rescues each year (Surf Life Saving New Zealand, 2018).

Figure 4. Surf Lifesaving New Zealand. (n.d.) ARANCIA IRB

IRB OPERATION - The Inflatable Rescue Boat (IRB)

John Speight of ARANCIA was the designer of the first ARANCIA IRBs and is still in charge of design today (43 years later) (Arancia, 2018). SLSNZ ARANCIA IRBs are 3.8m, soft hull inflatable boats explicitly designed for SLS and surf rescue operations. ARANCIA IRBs are made of neoprene-coated polyester fabric with a Hypalon outer surface that is very durable and resistant to UV radiation, water, gasoline, and oil (Arancia, 2018). The boat and the motor are separate components.

Surf Life Saving New Zealand approved the existing IRB design in 1979, and to date, most of nearly 1000 have been produced by Arancia produced are still in use worldwide (Surf Life Saving New Zealand, 2018).

Much like the boat, the outboard was designed explicitly for SLS and surf rescue operations (Seven Sharp, 2020). The current outboard is a Mercury 30HP surf engine. What differentiates an SLS outboard engine from recreational engines is that it has been adapted/strengthened to suit surf rescue operations and enhance safety and performance (Arancia, 2018).

Specifications (data collected from the Arancia website).

- Length 3.88m
- Weight Hull 44kg
- Max Engine Size 30hp
- Floor 24kg
- Floorboards – Fibreglass laminate

Figure 5. Surf Lifesaving New Zealand. (n.d.) IRBs in competition

IRB OPERATION - The IRB Outboard

Design and features of an IRB engine

The Mercury 30hp surf engine has evolved through a SLSNZ evaluation process (as does all SLS equipment) to be the surf engine of choice.

- 30hp
- Single carburettor
- Two stroke (cycle)
- Manual pull start
- Fitted with a propeller guard and stainless steel propeller
- Strengthened to suit surf rescue operations and to enhance safety and performance.

IRB engine features A11 to A15

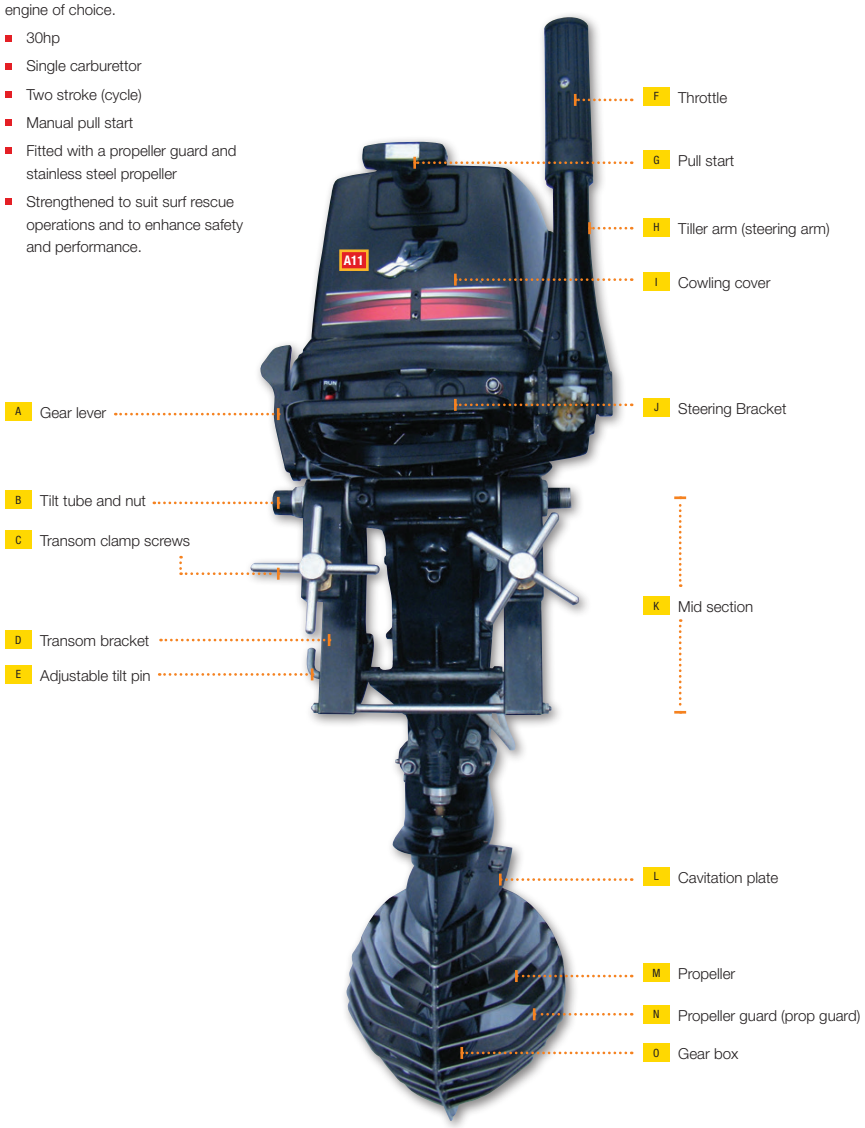


Figure 6. Surf Lifesaving New Zealand. Design and features of an IRB Engine. 2018 by SLSNZ from https://www.surflifesaving.org.nz/media/987027/irb-manual-_sept_2018_web-compressed.pdf

IRB OPERATION - The Qualification

IRB operation and IRB surf rescues are physically and mentally complex and rigorous (Surf Lifesaving New Zealand, 2019). Operating requires a vast amount of maintenance, skill and knowledge, as seen in the IRB manual provided to those recruiting. A qualification/ course is offered to lifeguards (over the age of 16) interested in IRB operation (Surf lifesaving New Zealand 2021). Phoebe Havill (a founding member of the Wahine on Water programme) expresses in an interview that “Once you have got your IRB drivers qualification, it’s a prerequisite for advanced lifeguard school. You are more likely to go on to become a patrol captain; you are more likely to get a job as a regional lifeguard. It is important in terms of leadership positions” (Surf Lifesaving New Zealand, 2019).

The qualification has several theoretical and practical components such as surf navigation, solo driving and maritime regulations to prepare Surf Lifeguards for IRB use (Surf Lifesaving New Zealand, 2018). The course is approximately 2-8 weeks long and is open to anyone interested in IRB operating.
Guards interested will be educated in:

- IRB engine
- Engine reinstatement
- IRB engine set up
- Maritime regulations
- Driving skills
- IRB engine closedown
- Rescues
- Operations

Figure 7. Surf Lifesaving New Zealand. (n.d.) IRB Operators

IRB OPERATION - IRB Racing

In an article, Surf Life Saving New South Wales (SLSNSW) (2019) mentions that IRB Racing is a relatively new addition to Surf Life Saving. Strong competition teams flourished in Australia from the mid-1970s to the late 1990s, with their creativity and love of the sport contributing to the evolution of the IRB and its role in saving lives (Surf Lifesaving New South Wales, 2019).

SLSNSW warns that "IRB competition can be inherently dangerous. Through their participation in IRB events, all members agree with, acknowledge, and understand the dangers and accept and assume the inherent risks in IRB competition. IRB competition and racing promote the skills required to complete a successful IRB rescue, which is a fundamental ability for patrolling members".

There is a variety of different event types in IRB racing. These include IRB Rescue, IRB Mass Rescue, IRB Team Rescue, IRB rescue tube and IRB relay (Surf Lifesaving New South Wales, 2019). The event described all share the same objective, to competitively navigate through the surf and retrieve patient/s back to shore (i.e., a rescue simulation). IRB racing is considered a male-dominated sport within SLS. SLSNZ states that of the 60 crews competing at the North Island IRB Championships (one of New Zealand's most significant IRB racing events), only 19 are made up of female operators (SLSNZ, 2020).

Figure 8. Surf Lifesaving New Zealand. (n.d.) IRB Racing

IRB OPERATION - ARANCIA

ARANCIA (2018) is a small business focused on creating high-quality inflatables that are still safe to use. SLSNZ asked John Speight (owner of ARANCIA) to develop a craft exclusively for surf use/rough inshore conditions after previously specialising in small tenders for recreational use (Arancia, 2018). A concept was selected and circulated to SLS clubs throughout New Zealand after various design reviews, modifications, and trials from surf clubs (Arancia, 2018). Since then, ARANCIA has dedicated itself entirely to the manufacture of rescue boats. It continues to play an essential role in producing surf rescue craft in New Zealand, Australia, Indonesia, the United Kingdom, and the United States.

Figure 9. Surf Lifesaving New Zealand. (n.d.) ARANCIA IRBS at club

WOMEN IN SPORT - Historical Perspective

Women's sports developed prior to 1870 in the form of recreational activities (rather than competitive) that emphasised physical fitness due to their informality and lack of regulations (Gerber, Felshin, Berlin, & Wyrick, 1974). In the 1800s, it was widely believed that each person had a set amount of energy. It could be hazardous if this energy was used for both physical and mental activities at the same time (Park & Hult, 1993). According to Clarke (1874), horseback riding, showboating, and swimming became common, but women were not encouraged to participate. Women were considered to be more vulnerable to such physical activities during menstruation since they were "periodically weakened". This attitude towards women participating in sport continued for many years despite examples of women participating and undergoing these physical tasks (Park & Hult, 1993).

Since they did not need physical contact or pressure, golf, archery, and croquet were the first sports to recognise women in the 1870s. Women's physical recreation activities and opportunities were restricted because perspiring, physical touch, and competitiveness were not socially acceptable "ladylike" behaviours (Wilde 2007). Women's participation in many sports were hindered by stereotypes of appropriate women's sports and female physiology (Appleby 2013).

Blyler (2012) states that by the early 1900s, women started to participate in more recreational and competitive sports. The 1900 Olympic games were the first to introduce women as participants. Very few entered and gained any publicity out of fear and unacceptance. The 20th century changed the social view of women in sport drastically. Slowly, women became accepted into sports and sporting communities. The London 2012 Summer Olympic Games were a testimony to these changing times, serving as a gender equity milestone. All 26 Olympic sports were open to both men and women, and all countries represented had female athletes (Grappendorf, 2013). The 2012 Olympic Games were also the first to feature more female competitors than male athletes from the United States (Grappendorf, 2013).

WOMEN IN SPORT - Gender Equity in Sport

In her article, Appleby (2013) states that “sport is one of the most celebrated and contested institutions in our society. In ancient times, sport served various social functions, from spiritual and religious expression to applied practice for warfare”.

Sport has long been seen as a spectacle by the general public, both for entertainment and social reasons (Appleby, 2013). Sport is an essential part of our global social structure, regardless of its meaning or appearance (Appleby, 2013). As a form of recreation, Sport allows people to have a good time and engage in meaningful social contact with their friends and rivals. Appleby (2013) states that sport has created opportunities, but it has also entrenched harmful and dangerous social patterns like segregation, gender inequality, and homophobia.

Through my experiences with SLS, I observed/ assumed that male dominance and gender inequity is a prevalent culture pattern within IRB operation. The term gender is a social construction used to assign appropriate behaviours to the female or male sex (Appleby, 2013). According to Appleby (2013), socially constructed ideas determine which sports women, men, boys, and girls can play in. Male sports (such as football, wrestling, and boxing) and female sports (such as swimming) are defined by society (i.e. dance, equestrian and gymnastics). Crossover results in these sports often cause uproar due to our socially constructed assumptions of what is acceptable behaviour for boys and girls (Appleby, 2013).

The European Sports Commission (ESC) (2014) states that gender equality in sport improves the facilities’ efficiency. Women in sport offer a variety of role models for both girls and boys, as well as methods that inspire both girls and women to participate in sports. Gender Equity benefits IRB operation and SLSNZ by providing more IRB operating, qualified guards in the organisation and influence between females in the sport.

PRECEDENTS - Womens Eight's Rowing

World Rowing (2016) states that Eights rowing canoes had been "developed and built for absolutely everyone, but for no one in particular", presenting a problem in usability and ergonomics to the female rowing community who were marginalised by this design. Acknowledging that men and women generally have different height and weight ranges, reaches, and grip strength, a redesign of equipment to better the performance and comfort of women in the sport was pursued (World Rowing, 2016). Anatomical differences between men and women in hips size, hand size and limb length play a role in how athletes interact with the equipment (World Rowing, 2016).

World Rowing (2016) inform that "rowing in equipment designed for someone with a completely different size and shape can make things difficult, if not painful". After decades of training and racing in equipment built for male athletes, female rowers now sit in boats designed uniquely for them (World Rowing, 2016). In reflection, I see Women's eights rowing as evidence of a sport that has ergonomically facilitated and catered for males and females through considered ergonomic design.

Figure 10. Locker room (2019) 2020 Kiwi Womens Eights Rowing Team

PRECEDENTS - HOC Rescue Power Tool

After finding that most hydraulic cutting tools on the market today are designed for industrial use rather than rescue operations, and have low usability and ergonomics, HOC was developed (Tran, 2011). The current hydraulic cutting tools are considered difficult to use in high-demand rescue operations where versatility is essential (Tran, 2011). While hydraulic cutting tools can cut through tough materials, including high-carbon alloy steel, they are challenging to carry and use at a car accident site (Tran, 2011). Because of its enhanced physical and cognitive ergonomics, HOC is a solution that assures protection and fast extrication (Tran, 2011). The implementation of the circular handle accommodates the different work postures of the first response worker, decreasing the risk of injury or improper technique of use. Ayetekin's design proves that simple, considered ergonomic design additives to existing products can improve its experience and potentially allow a physically diverse range of people to use this tool effectively.

Figure 11. Long Tran (2011) HOC Rescue Power Tool

PRECEDENTS - Title IX

Title IX was established in 1972 to ensure that everyone has equal access to any programme or activity that receives Federal financial assistance, including sports (Women's Sports Foundation, 2016). This means that federally funded institutions, such as public schools, must provide equal sports opportunities to girls and boys (Women's Sports Foundation, 2016). Title IX guarantees female athletes in federally funded educational institutions, from elementary schools to colleges and universities, the right to compete in sports on an equal footing (Women's Sports Foundation, 2016). Title IX states that "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving Federal financial assistance" (Women's Sports Foundation, 2016).

After the enactment of Title IX, there has been a gradual rise in American women's Olympic participation. We saw hundreds of girls who benefited from the legislation make history this summer. Donna Lopiano notes, "The rest of the world will learn a lot from Title IX. We have the largest base of athletic development. Our women are going to dominate, not only because of their legal rights but because women in other parts of the world are discriminated against." (Women's Sports Foundation, 2016).

Figure 12. The Radiance Foundation (2018) Title IX Poster

PRECEDENTS - Wahine on Water

WOW (Wahine on Water) is a programme run by SLS women with the goal of increasing female participation, competence, and confidence in IRB operations (Surf Lifesaving New Zealand, 2019). WOW's (Wahine on Water, 2019) research reveals that while 50% of surf lifeguards are female, only 28% of our IRB drivers are female. It's safe to say that IRB driving and activity is an SLSNZ male-dominated sector (Wahine on Water, 2019). The WOW programme tackles and attempts to even this figure by offering free, supportive IRB introductive classes to women in SLS (Wahine on Water, 2019).

WOW chairwomen Julia Conway states in an interview, "The networking day intends to provide women more time in the boat in a supportive low-stress environment. A lot of people are a bit intimidated by the IRBs. They can go pretty fast, and it can be pretty scary out there in the big waves – males are keener to get in them and go for it than females. Females tend to take a step back. So, we wanted to show everyone that they are quite capable, and by having female instructors, it meant the girls could see them getting out there and see that they can too." (Surf Lifesaving New Zealand 2019).

The WOW program is testimony to an existing attempt of 'levelling the playing field' by promoting gender equality and encouraging SLS women to participate in IRB operation. I saw an opportunity for industrial design intervention to contribute to this vision or even help WOW in their efforts.

Figure 13. Surf Lifesaving New Zealand (2019) Wahine on Water Programme

PROJECT AIMS

Published experiences (of women), information about SLSNZ, and historical evidence of female discrimination in sport/ SLSNZ gave foundations for the research I was to embark on. With the information gathered in the contextual review, project aims were formed to set a trajectory and produce a vision for this research. The vision was to design ergonomic products to better the more physically challenging areas for women who are new to/ participate in IRB operation. The project aims formed through this contextual research included:

- Understand which areas of IRB operation women find physically challenging and why.
- Understand why there is a lack of women who operate IRBs (compared to men).
- Discover/ potentially unpack a potential culture of male dominance and gender inequity in IRB operation.
- Empower women who are interested/ already participate in IRB operation through industrial designed, ergonomic product.
- Explore ergonomic solutions and ways of benefitting women who operate IRBs using appropriate design methods and solution/s.

CONCLUSION

Participative/ human-centred design method/s seemed the most appropriate method to implement in this research. In collaboration with women who operate IRBs, I aimed to understand the merit of considered industrial design in a male-dominated SLS activity. I saw value in including women who operate IRB's consistently throughout the research. Their feedback would ensure satisfying design outcomes, allowing me to check my assumptions/ biases in the study area. These design methods had the opportunity to empower the women/ participants assisting in my research and discover/unpack a potential gender equity issue in IRB operation (and perhaps in other unseen areas of SLSNZ). The project aimed to explore and/ or resolve ergonomic design and culture issues in IRB operation to answer the following research question:

RESEARCH QUESTION

The project examines how designed products can improve aspects of Inflatable Rescue Boat (IRB) operation that female operators find intimidating/ physically challenging. In relation to gender equity in sport, this research explores how Human-Centred Design can unpack/ identify IRB operations requiring ergonomic design attention to positively impact female participation in the SLS activity?

Methodology

Participatory Action Research - My First Intention

PAR (Participatory Action Research) is an approach that encourages collaboration between researchers and participants to better understand and improve a problematic situation (Institute of Development Studies, 2020). It entails people concerned about or affected by a problem taking the lead in developing and using information about it (Pain, Whitman & Milledge, 2020). Participants in a PAR approach are not considered test subjects but rather active contributors who engage in various stages of the research process (Chandler & Torbert, 2003). I initially intended to undertake this research collaboratively with SLS women. This community's involvement was considered essential to provide me with a better understanding of their unique experiences in operating IRBs. My preliminary thoughts were that implementing a PAR approach would create an equal relationship between myself and SLS women in a research project with potential social complexities.

As mentioned above, I initially set out to use PAR as the primary methodology underpinning my research. However, during the early phases of recruitment, I discovered that the women I aimed to recruit were busy over the summer holidays (where I intended to conduct a large proportion of my collaborative work). As such, they could not commit the time required, and their level of intended participation was reduced. A large portion of the participants worked as paid guards over the summer. These commitments took up their time outside (socially) and inside (affecting their ability to train/ operate IRB's) the SLS environment. Ethical barriers such as age also limited my outreach of participants. Many of the potential participants (available and interested) were under 18 and not eligible to participate in the research (see AUTEC's approval process below).

ACTION RESEARCH

Action research (AR) is a paradigm of enquiry in which the primary goal of the researcher is to develop his or her ability, and subsequent practises rather than producing theoretical knowledge (Elliott, 1991). Improving practise ensures that the overall consistency of the process and products is improved (Bell et al, 2004).

In my situation, I view what separates AR from PAR as the active participation of the participants in the research throughout the research process (PAR). As I was unable to gain the active and ongoing involvement of IRB operating females, I used Human-Centred Design (HCD) methods and techniques to collect data when I was able to converse and interact with my participants underpinned by an Action Research methodology. In my research, it was important that I held a trait of PAR and collaborative design (co-design) in my AR methodology. The overlying trait was to consider participants as active contributors rather than subjects of research. Bell and his team (2004) state that a distinguishing feature of AR is that the researcher initiates change based on a sense that something has to change in order to improve human conditions. Through the method, the researcher directs the realisation and transformation of values. By using AR methodology using HCD and co-design inspired methods, it was hoped that there would be an opportunity to spark a behaviour change towards gender equity and female guards' competence/ confidence in IRB operation.

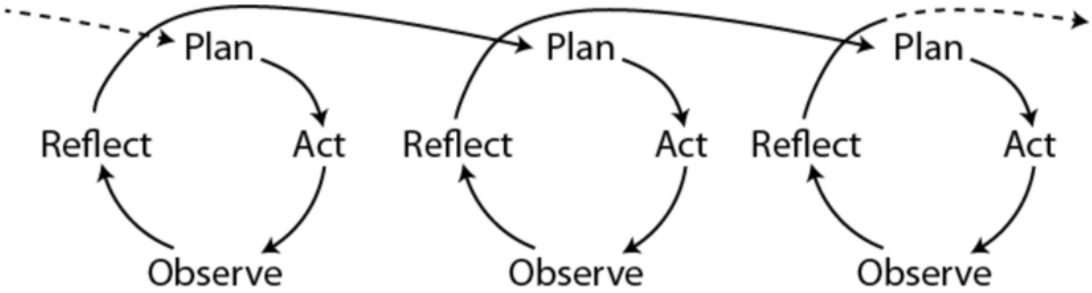


Figure 14. Illustration of the Plan-Act-Observe-Reflect Cycles in the PAR Process from Collaborative Family Therapy in Child- and Adolescent Mental Health Services. by N. Jorring, 2017, 36, 10.1521/jsyt.2017.36.1.48

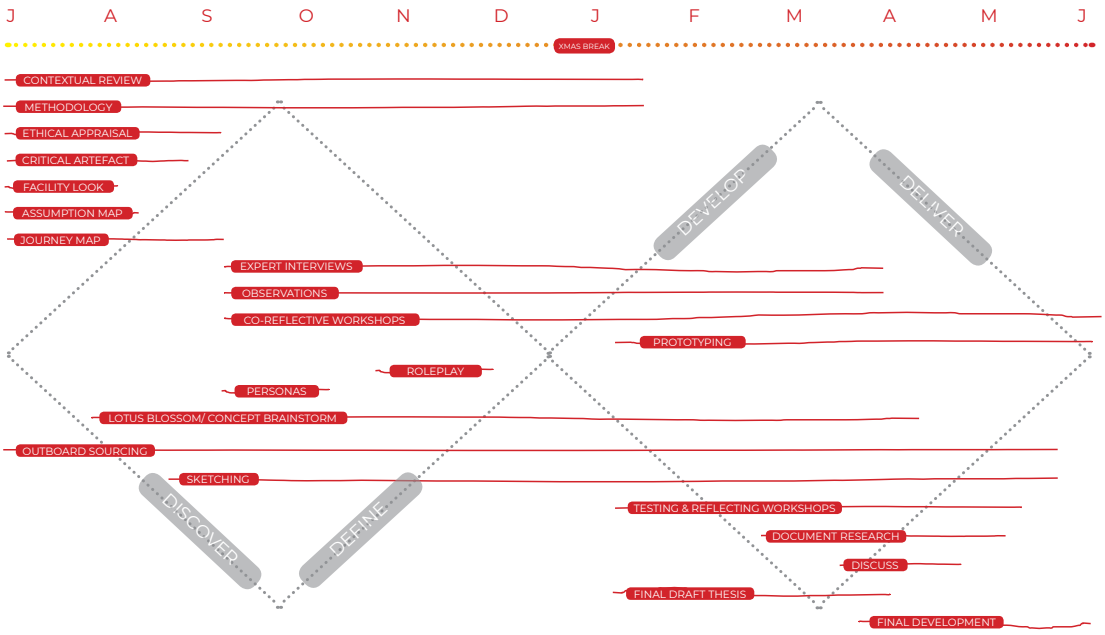


Figure 15. Jenkinson, (2020). Gantt Chart

KEY FRAMEWORKS - Human-Centred Design

Van Der Bijl-Brouwer (2017) details that Human-centred design (HCD) is a group of methods and principles aimed at supporting the design of useful, usable, pleasurable, and meaningful products or services for people. Empathy is at the heart of human-centred design, which assumes that the people you're designing for are your road map to creative solutions (Van Der Beijl Brouwer, 2017).

HCD refers to the process of communicating with, interacting with, empathising with, and stimulating the individuals involved in order to get a better understanding of their needs, desires, and experiences, which also goes beyond what they are aware of (Giacomin 2014). Implementing codesign inspired techniques and HCD methods into this research enhanced the productivity and work relationship between researcher and SLS women. The target audience's involvement ensured the study underwent an effective design direction, one that could produce a satisfying and ergonomic outcome.

Research techniques such as participant observation allowed me to understand the unfiltered behaviours of SLS women operating existing IRB designs. Insights/ opinions were further investigated through expert interviews and analogous inspiration methods.

KEY FRAMEWORKS - Empathic Design

Thomas (2013) states, “For products and services to be effective, they need to satisfy both functional and emotional needs of individuals. In addition, the user needs to feel that the product and/or service has been designed just for them; otherwise, they may misuse, underuse, or abandon the product/service”.

The best way to truly understand the context and complexities of the people you’re designing for is to empathise with them (Thomas, 2013). Perhaps, most importantly, it puts the people you’re designing with at the centre of everything you do (Thomas, 2013). Using both an empathic and collaborative approach ensured that the target audience’s emotional and physical needs were met. Therefore, my goal was to involve the participants as much as I could within the research.

Using empathic research methods, I aimed to understand the ergonomic and emotional needs of IRB operating women. In my project, meeting the psychological needs of women who operate IRBs is more important than meeting the physical. I wanted this product to satisfy the user, something they are happy to implement/ in using or training with. Thomas quotes, “If something resonates with you on a deeper level, it builds loyalty and generates a real shift in behaviour” (Thomas 2013). I saw an opportunity for empathic design methods to help shift an existent behaviour/ culture of male dominance in IRB operation.

KEY FRAMEWORKS - Collaborative Design

Sanders & Stappers (2008) express that collaborative design (codesign) is a suitable framework in providing equality and trust between researcher and participant. Codesign is a practice whereby designers and non-designers engage in various creative activities to articulate participant knowledge and experience of the context being explored. A fundamental tenet of codesign is that users, as 'experts' of their own experience, are central to the design process (Chisholm 2020). The implementation of codesign methods aimed to empower IRB operating women participating in the design process. Codesign helped raise empathy and brings user experience to the forefront of the design process (Langley, Wolstenholme and Cooke, 2018). Moreover, this sharing of each user's experience is key to building trust in groups with diverse stakeholders (Langley, Wolstenholme and Cooke, 2018). Its participatory nature assuaged issues of gender and hierarchy between researcher and participants.

Hagen & Rowland (2011) explain the role of the designer or researcher in codesign is to assist participants through a series of creative methods that help access participants' thoughts, feelings, ideas and experiences. In doing so, participants begin to access feelings and experiences that they are not often asked to reflect on (Haagen & Rowland, 2011). Codesign methods/workshops are intended to foster a sense of immersion, conversation, and empathy for those who may use and experience the design (Haagen & Rowland, 2011). The data collected from the collaborative workshops contributed to the design direction, knowing that the insights gathered were genuine and informative observations/ reactions from IRB operating women.

Figure 16. Summer Studentship IRB Footstrap Team (Project not related to Masters). (2019). Collaborative Testing Workshop

RESEARCH METHODS - Literature/ Contextual Review

Monash University (2021) states that “A literature review, in essence, recognises, reviews, and synthesises relevant literature within a specific field of study. It clarifies how science has progressed in the field, highlighting what has already been achieved, what is widely accepted, what is new, and what the current state of thought is on the subject”.

A literature review was first conducted to refresh my memory of IRB operation and inform me of any improvements within IRB operation (when assumed there are none). Researching the history of SLSNZ and its discrimination towards women helped place me in a more objective point of view (compared to where I once was). Unknowingly, the literature helped me check my biases and assumptions, providing me with a trajectory into working professionally with the participants. The research and topics I explored deepened my position and understanding of the context; through this, I validated some of my assumptions and identified gaps of knowledge/ design opportunities.

RESEARCH METHODS - Expert Interviews

Bogner, Beat, and Wolfgang (2009) insists that interviewing experts during the exploratory process of a project is a more effective and focused way of collecting data than participatory observation or formal quantitative surveys. Implementing expert interviews was an effective method to depict my design trajectory early in the project. I conducted expert interviews specifically focusing on surf lifesaving equipment and women who operate IRB's. The absence of male IRB operators from the research was intentional and allowed the participants to share honest opinions without feeling judged by male peers. Some men were approached (IRB instructors) as they held specific experience and knowledge about IRB operation.

Bogner (2009) (p02) states that expert interviews are effective in "those kinds of situations in which it might prove difficult or impossible to gain access to a particular social field (as is the case, for instance, with taboo subjects)". I positioned myself as the industrial designer in this research project and aimed for SLS women to feel comfortable sharing insights, critiques, and opinions. I found that Cralleys (2005) article helped shape 'what I was to say' and 'how I was to say it' appropriately, helping form an equal and healthy work relationship between researcher and participant.

RESEARCH METHODS - Criticial Artefact/ Cultural Probe

Rather than acting as solutions, critical artefacts raise questions and encourage dialogue in order to gather rich, in-depth data that can be used to better understand the needs of a specific group of people. (Chamberlain et.al 2013). For example, researchers in Lab4living designed a set of critical artefacts to approach and discuss end of life care appropriately. Labelled Life Café, the subtle approach of the activity, made the subject of death more palatable to the user (Fisher et.al 2019).

Critical artefacts were used when introducing/ first discussing what I assumed to be a complex subject that affected SLS women. I designed a card activity/ cultural probe to 'break the ice' between researcher and participant and unpack insight and attitudes SLS women have towards IRB operation. In her website article, Legros (2018) states that "Cultural probes are a qualitative research tool where open-ended activities are given to a group of participants to learn more about their daily lives and environment. They help start conversations between designers and participants, bringing novel insights". The activity provided a safe space and sparked a trusting work relationship between the researcher and the participants involved. The card game was designed/ helped to create a fun space and positive relationship between its player/s and conductor. The use of a critical artefact/ cultural probe aimed to help participants feel more comfortable sharing their experiences. The activity allowed data collection to become less like direct questions and more a fun, relatable experience with the group participating in the game. The conversations sparked while playing the game were valuable sources of insight/data collected on-site (as we were playing). The data would be further analysed and designed with consideration later in the project.

Figure 17. Jenkinson, (2020). Developing Critical Artefact

RESEARCH METHODS - Participant Observations

Participant observation is a qualitative analysis tool that can include a great deal of evidence and is often used in PAR (Marshall, 1989). Marshall and Rossman (1989 p79) define observation as “the systematic description of events, behaviours, and artifacts in the social setting chosen for study”. Observation helped me collect data on-site (with participants) and provide information that would become a reference to look back on and analyse.

I observed participants operating IRBs to understand precisely which aspects of the activity need ergonomic design attention. This exercise was conducted twice on different days with two participants. The intention of conducting more than one of these exercises was to identify if aspects such as environment would affect the participants and their ability to operate IRBs, providing design constraints to my research. The participants were women that race IRBs competitively and were aged 20 and 21. (the community that interact with IRBs the most). The first exercise was exploratory. The goal was to re-introduce myself (objectively) to the activity and validate the preliminary assumptions regarding IRB operation.

Observations were undertaken at all points of interaction, from setup to pack down and use of the IRB’s. Surf rescues scenarios/ Patient retrievals were also conducted with both researchers and participants aboard the IRB, both taking effect at a surf club on Auckland’s East Coast. This method’s implementation was to identify and highlight areas of IRB operation that were physically or mentally difficult for participants. The data collected was recorded or photographed to be used as evidence and visual cues for design ideas.

RESEARCH METHODS - Roleplay

The second set of observations were conducted through a roleplay exercise. Think Design (2021) regard roleplay as a method to assist design ideation in research. Roleplaying makes for much more intuitive, natural, and real insights than other concept ideation approaches such as focus groups, dyads and triads, or brainstorming (Think Design, 2021). Furthermore, roleplaying simulations offer richer perspectives with a lot more information, allowing designers a lot more options for recalibration (Think Design, 2021).

Using roleplay, I aided in performing a rescue simulation, acting as both a rescuer and patient with women who operate IRBs. I observed the participants performing IRB operating duties while in the boat and had the opportunity to conduct IRB rescues myself. I helped the participants perform maintenance duties (set up and pack down); I was given the whole experience of an IRB training procedure. Implementing a roleplay exercise helped me understand the physical and mental challenges/discomforts of IRB operation. This exercise helped me realise that the improvement of 'on land' IRB operating/ IRB maintenance duties positively benefits the target users and better tackles my vision for this research. The data collected in this exercise were analysed and provided design direction for developing ideas.

Subsequently, the observational exercises allowed me to gain feedback from participants (on existing IRB equipment). Feedback provided design direction for the following workshops and prototypes.

RESEARCH METHODS - Collaborative Workshops

I intended to conduct these workshops during and after women's IRB training sessions. This research project relied on feedback sessions/ workshops to ensure that the participants considered the developing prototypes and design directions feasible and satisfactory. Collaborative/ reflective workshops allowed me to identify ergonomic limitations and factors around IRB operation that affected design autonomy. The design constraints identified include waves, sand, salt and interaction with other equipment.

SLS women provided feedback/ insight into what satisfies/ is ergonomic to them, contributing to the next design's improvements. Nick Babich (2018) states, "The primary goal of workshops is to identify usability problems, collect qualitative data, and determine the participants' overall satisfaction with the product".

Inspired by co-designs nature of placing participants as design partners rather than subjects, I gained feedback/ insights from women who operate IRBs in a fun, effective way. The workshops conducted helped to form a healthy work relationship between the participants and researcher (myself). The expertise and experience of women who operate IRBs were unique and vital to the practical outcome/ acceptance of this research and its result. Rules were provided to protect their identities in the research; these included constraints around the confidentiality of each others' identities and their input (detailed in pg 182).

Numerous workshops were planned (via consultation) after training sessions with these women. Unfortunately, the busyness/ lack of training sessions and COVID 19 related worries impacted the number of co-design workshops I conducted. To resolve this, an HCD approach was implemented more heavily than anticipated. I conducted each workshop intending to gather as much data as possible, knowing that the participants training sessions were flexible and not as periodic as promised.

I do not consider the method I resulted in using as 'co-design workshops'. The workshops were co-design inspired. These sessions were collaborative, reflective sessions with women who operate IRBs.

Figure 18. Summer Studentship IRB Footstrap Team, (2019). Co-design/ Tech Testing meeting

FOCUS GROUP/ COLLABORATIVE WORKSHOP - Protocol

Focus groups/Workshops involved undertaking activities as part of the normal IRB operating procedures/ training. The workshops were reflective sessions that critiqued existing and developing designs. Each workshop was conducted with the same two recurring participants (women who race/ operate IRBs). I intended for the other participants (women who operate IRBs who are older) to join these physical sessions. Yet, due to family and work restrictions, their participation in this research was minimal (only engaging in the critical artefact session and user interviews).

The first collaborative session was conducted on the water using existing IRB equipment. After we tested the current IRB gear, we reflected on and critically analysed what was mentally and/or physically difficult about their experience with each piece of equipment. This workshop arranged the IRB operating procedures into three general categories of activities as follows:

- Assembling and preparing IRB's and related equipment in the club house/ storage garage in preparation for use.
- Transportation of IRB's and related equipment to the beach.
- Performing on water training activities, such as simulated rescues.

FOCUS GROUP/ COLLABORATIVE WORKSHOP - Indicative Questions.

The collaborative nature of the workshops meant that each session was reflected on by those participating. Questions were asked about specific experiences they have/ had operating IRBs. The comments made acted as valuable data and direction in my research.

Indicative questions included the following:

- How do you feel about the interaction with this aspect of IRB operation?
- What about the design was comfortable/ easier for you to use compared to the existing design?
- What about the design is challenging to use?
- How do you think this design might impact SLS women's participation in IRB operation?

In each session, photographs were taken, and notes were made (by the researcher) to document the experiences shared. Insights, comments, and thoughts were compiled, reviewed, and summarised in a document that outlined the key insights and findings. This collected data helped determine future design direction and the form/ function of the next iteration to be observed and reflected on with the participants once again. Three reflective workshops were conducted.

ANALYSIS METHODS - Personas

Personas are fictitious characters designed to portray the various categories of users who might use your service or product in a similar manner (Fris Damm, Yu Siang, 2020). A product team should use personas to answer one of their most critical questions: “Who are we designing for?” It is possible to create a product that can meet consumers’ desires and therefore be effective by first considering their preferences, interests, and motives. (Babich 2019).

Data were analysed by reviewing notes, photographs and other data collected and constructing themes. Personas were then developed by using these themes and insights to help better understand the target user from a different perspective (i.e., the perspective of a different gender (Babich 2019)).” Personas helped me empathise and better understand the research participants and the target user/s in greater detail. The personas were designed with the data gathered from collaborative workshops and interviews with women who operate IRBs. The personas of women in IRB operation helped ‘set the scene’ for this research and issue, providing a reference point for SLS’s culture and context. The persona highlighted the end users’ characteristics and provided me with design parameters/ constraints.

ANALYSIS METHODS - Journey Map

According to Gibbons (2018), A journey map visual represents a person's steps to achieve a goal. Although user journey maps come in various shapes and sizes, they are most commonly depicted as a timeline of all user-product interactions (Gibbons, 2018). This timeline provides information on all of the ways in which users communicate with a product (Gibbons, 2018). It aids in the visualisation of how a user interacts with a product and enables designers to see a product from a user's eyes (Gibbons, 2018).

IRB operation is an avenue of SLS I am foreign to despite my many years and experiences in SLSNZ. To better understand IRB operation and discover what aspects of the activity require design attention, I needed to learn and understand an IRB surf rescue and maintenance process in its entirety. Designing a journey map with an experienced IRB operator helped educate me in IRB operation tasks and formulate how to conduct collaborative workshops involving areas of IRB operation I perceive as design opportunity areas. Understanding the touchpoints and process of an IRB surf rescue helped me design data collection methods. The journey map helped form the critical artefacts and activities around IRB surf rescue processes. The result of the critical artefact was familiar to the participants, allowing them to feel comfortable and trusting of the design process/ method.

ANALYSIS METHODS - Design Brief

Fontaine (2019) refers to a design brief as a written document that outlines the goals, priorities, and milestones of a design project and is an important part of the design process. It aids in the development of client-designer confidence and understanding (Fontaine, 2019). It is just as critical as a contract and acts as a crucial reference point for all parties. Before starting work, the designer ensures that crucial design issues are considered and addressed (Fontaine, 2019).

The research I embark on is multi-faceted; numerous physically challenging areas within IRB operation affect women's participation. The physically challenging areas can be resolved through design outcome/s, whether industrial/ product, communication, or critical design results. I found a design brief that allowed me to narrow my design scope. The design brief became (as Fontaine states) a reference point for this research, reminding me of the specific vision and issue in SLSNZ I wanted to tackle. The design brief became a good source of communication/ reference for my participants, allowing them to understand this research and its design outcome.

The design brief provided specifications on how I was to design this product successfully. Through the design brief, I chose which aspect of IRB operation would most effectively resolve the ergonomic and culture issues I was interested in. When forming the design brief, I decided what aspect of IRB operation would best fit my skills and capabilities as an industrial designer. This exercise allowed me to look objectively at the research project and choose how I (as an industrial designer) could best benefit women who operate IRBs through designed product/s.

IDEATION METHODS - Sketching

In a process of interactive imagery, sketching is a form of ideation that facilitates visual reasoning and generates new ideas (Goldschmidt, 1991). It also allows designers to visualise their current ideas, which helps them better understand the design problem (Schön, 1992). Sketching also acts as an important means of communication between designers and consumers (Ferguson 1994), as it allows for the easy capturing and communication of ideas while maintaining design independence (Goel, 1995). This method was implemented to visually communicate the potential outcome/s of the working prototype/s to those participating in my research. Sketches also became helpful reference points in communicating to technicians the feasibility of each concept as a prototype.

IRB operation is considered a complex sport, even to those who are qualified. A visual representation of the concept helped the participants understand the design if implemented into the activity. We then reflected on the feasibility of these ideas/ sketches. Sharing early examples of ideas through a collaborative design process has helped me pursue a design direction that is satisfactory to the user's needs at an early stage of the project. I was able to avoid design directions that may have been deemed ineffective by the target user/s.

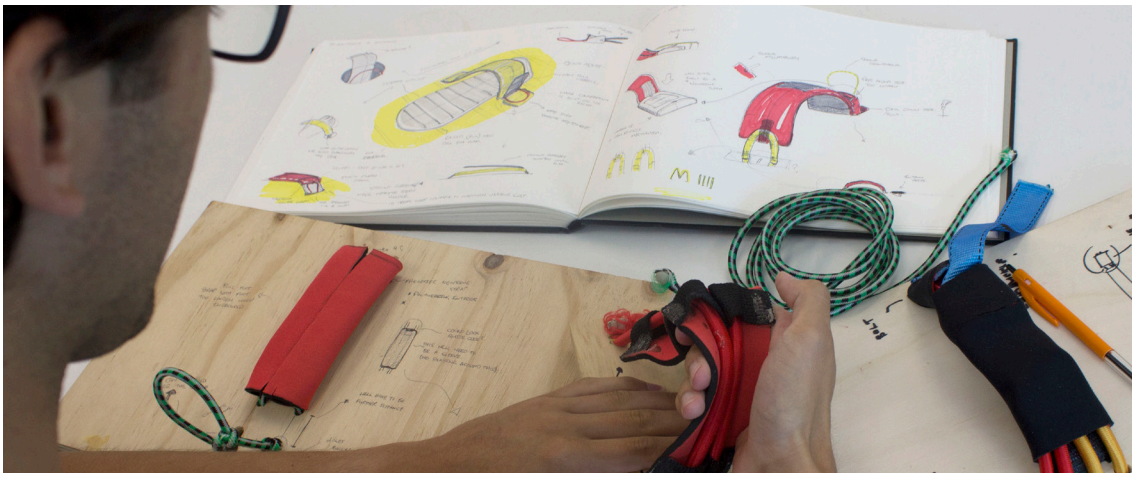


Figure 20. Jenkinson (2019). Foot Strap Prototyping

IDEATION METHODS - Assumption Mapping

Bland (2021) states that behind every new product or service hides leap of faith assumptions. If proven false, these important and yet unknown assumptions can make or break your initiative. This method is designed to deconstruct these assumptions as a team down into specific areas to help focus your experimentation.

Assumption mapping is a technique for detecting potentially dangerous assumptions regarding a new product or service (Pedicini, 2021). The goal is to improve products by recognising the assumptions about a new idea's desirability, effectiveness, and viability. (Pedicini, 2021). Coming from an SLS background, I have existing tacit knowledge in IRB operation, being involved as a crewman and participating in surf rescue scenarios. Despite interacting with this equipment, I did not consider myself knowledgeable in IRB operation or an experienced IRB operator.

Assumption mapping in this research unpacked all known assumptions (both risky and not so) I have with IRB surf rescue. The assumption map was made with consideration towards women who operate IRBs and benefitted this research by allowing me to observe this project through an unbiased lens. I found that unpacking and sharing the risky assumptions with my master's cohort helped me identify the most appropriate design direction (as a man designing for women who operate IRBs).

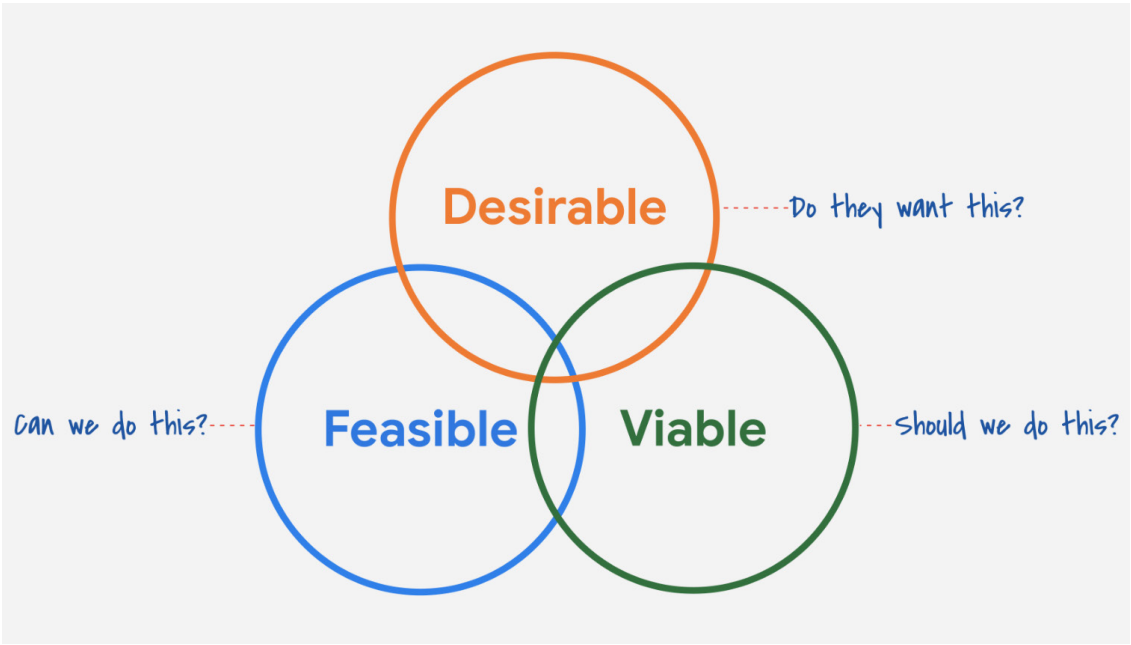


Figure 19. Bland D. J (n.d.) Assumptions Mapping from Design Sprints https://designsprintkit.withgoogle.com/methodology/phase2-define/assumptions-mapping

IDEATION METHODS - Prototyping

Don Norman writes, “The only way to really know whether an idea is reasonable/ feasible is to test it. These prototypes have to be tested through real interactions with the target population in order to refine the requirements” (Norman, 2013 p222- 235). Prototyping is the method of producing ‘quickfire’ models of the product you are building, designed to test the principles and ideas on which the product is based (Rapid Prototyping for UX Design, 2018). A prototype is a basic experimental model of a potential solution that can be used to easily and inexpensively test or verify concepts, design assumptions, and other aspects of its conceptualisation, allowing the designer(s) involved to make suitable refinements or possible changes in direction (Friis Dam, Yu Siang 2020).

The participant’s involvement and ability to reflect on developing prototypes was essential to a satisfactory design outcome. Without their participation, I undergo this research from an unchecked bias.

I was designing products considering both the target user and the IRB equipment/ environment it works in. I used prototyping to communicate ideas and design directions with women who operate IRBs and peers in my Master’s Cohort. The prototypes acted as artefacts for the participants to observe and critique during the collaborative workshops. The prototypes I made were functional and produced to test the design under a weight similar to a Mercury 30hp outboard. The designs aesthetics were considered in the latter of the functional prototyping phase (once I had a working prototype, satisfying to the target user). Functional mock-ups allowed me to design and test product/s in the absence of an existing IRB motor.

IRB parts and equipment are expensive. SLSNZ are usually hesitant to part with this equipment. Obtaining an outboard to use for prototyping/ designing had proved difficult. Prototyping methods allowed me to mock up/ mimic outboard shapes using cheap materials to test design additives without an available outboard. The use of a CNC machine allowed me to produce identical dimensions to the existing IRB outboard. I created low-cost prototypes and then tested them against/ with current IRB outboards (when accessible to me). Prototyping became a relied aspect of this research as the reality of obtaining an existing outboard became unlikely.

Figure 20. Jenkinson (2019). Foot Strap Prototyping 2

IDEATION METHODS - Computer Aided Design (CAD)

CAD is an acronym for Computer-Aided Design. It refers to the method of using computer software to create virtual models of proposed products (Velling 2020). Software's such as Rhino and Solidworks have helped me to communicate ideas virtually. 3D printing, Laser Cutting and Computer Numerical Machines (CNC) are production methods that have put form to concepts developed. The result of the manufactured parts allowed me to communicate and test the functionality of prototypes. I was able to produce templates and components of an IRB outboard when struggling to obtain a real one. Collecting measurements of existing IRB's, I was able to accurately 'mock-up' an IRB outboard frame to use as a structure/ body for designed prototypes.
The rendering functions helped communicate ideas in a more realistic setting. CAD Renders successfully communicated developing design ideas more effectively than a sketch of mine could.

ETHICS- Considerations and Limitations

Ethical Approval from the AUT ethics committee (AUTEC) (approval 20/260 on 27/6/20) was required to engage participants in the research.

IRB equipment is heavy and awkward to interact with, often used in a potentially unpredictable, rough coastal environment. Participant and researcher safety was considered. I questioned how we were to test and observe the use of existing equipment/ developing design appropriately in this environment and with these participants. SLS have experienced male-dominant culture and gender equity issues in the past (Simatos, 2016). I assumed a male-dominant culture could currently exist or potentially be an issue in this research. As a male working with predominantly females in this research, social barriers and ethical complexities could have presented themselves throughout the study. I was aware of the potential for a perceived position of power imbalance because of my gender.

As a man designing products mainly for women, I assumed/ planned for ethical perplexities. For example, participants involved in the research may be confused why I (a male/ man) wanted to undertake a project that helps women in aspects of IRB operation they find physically challenging. Issues related to differences in gender and my understanding of what women who operate IRBs need out of ergonomic product/s were assumed to arise.

The methodology I chose helped me check my biases in an area I have experience in (from a male perspective) and research more objectively. The methodological approach selected helped maintain a professional relationship between the researcher (myself) and the participants (mostly women).
On reflection, the formal aspects of ethical review proved difficult and time-consuming, resulting in significant delays in reaching out to participants. On a positive note, the ethical guidance and restraints set from AUTEC ensured the safety of myself and the participants involved in this research project.

The (paraphrased) considerations that heavily impacted my research included:

- Both participant/s and researcher are able to test existing IRB equipment in rescue scenarios and under regular training procedures. However, participants should not be permitted to test developing design/s produced by the researcher.

- The participant's age must be 18 and over (most participants interested were 16-17).

- To explore cultural issues effectively and safely, collaborative workshops should be conducted with women only.

Documentation of Research

Figure 21. Jenkinson (2020). Environment Walkthrough

ROLEPLAY IN THE SLS ENVIRONMENT

A walkthrough of the SLS environment (IRB storage facilities) helped me refresh my understanding of IRB operation, the facilities, and the equipment used within the sport. Conducting this walkthrough in the absence of operators and instructors allowed me to understand and perceive the environment, facilities and the equipment involved in IRB operation through an unbiased lens (without the biased opinion of surrounding IRB operators and instructors). By making a conscious effort to eliminate previous assumptions and bias towards IRB operation and its users, I perceived the environment through a 'beginner mindset', by imagining that I was experiencing this environment for the first time. This exercise reminded me of the sheer amount of equipment and components used in IRB operation, most of which were foreign to me (even with my tacit knowledge). Through a bronze lifeguard qualification (of which I have completed), I learned that trainees are taught how to pick up a patient and an IRB crewman's essential duties. The world of IRB operation is so much more than I had anticipated. An assumption map was produced using photographs taken this day to unload all my thoughts and insights into a tangible record.

ASSUMPTION MAPPING

With the data collected from the environmental walkthrough, I then visualised the findings from the point of view of an IRB operator. I annotated small opinions/ assumptions around these images to unpack areas of IRB operation that are feasible to design and capable of working successfully and were potentially a desirable/ satisfactory outcome for the target user.

IRB GEAR SHED.

- Straight away I observe that the aesthetic is masculine. Is this my perception/ stereotype coming into play? Everything looks heavy and complex.
- Motors are are seperate from IRB's, most are deflated. I deduce that the ATV's are used to transport the boats and trailers to the shoreside.
- A bit cramped? Although relatively tidy.
- Motors the only thing that is'nt high visibility it seems.
- In a garage, is a 'garage' another stereotype/ thing that evokes masculinity?

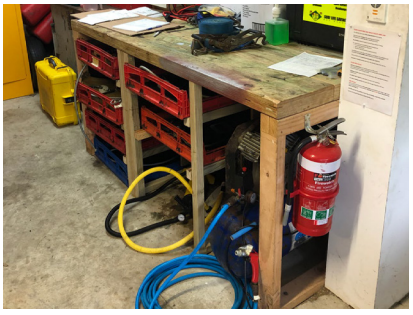
IRB MOTORS

- Honestly wouldn't know where to begin...
- I think the cowlings off to to prevent salt deterioration to motor parts.
- Heavy as it seems. most attach onto a ply thing (attaches via the screws tehy attach to IRB with).
- One is on a trolley, doesn't look too human centred or considered, more UCD design (making do with what they have access to).
- Down the back I notice chemicals, who knows what they're for.

MOTORS CLAMPED ON

- I want to assume that the motors seem like the most awkward/ heavy piece of IRB equipment
- These seem intimidating! I'm not even sure how or what to do with these pieces of equipment in this state. Even I would wouldn't touch this equipment out of unsureness.
- Are these delicate? It seems they need attention/ constant maintenance.
- I assume this piece of IRB equipment is intimidating to SLS woman, only reason being because it is for me!
- I assume there is alot of opportunity to design things so they are clearer and less visually complex/ intimidating here.

MAINTENANCE BITS



- Electric air pumps and so forth? Or it could be a bleeding kit? I assume pumping up can be very exhausting.
- Looks like they've been making there own footstraps? (blue polywebbing)?
- In the crates are each IRB's fuel bladders. I doubt theres any opportunity to change the fuel bladder, they seem pretty easy to use and understandable even for me.
- Shows the amount of equipment and cleanliness/ maintenance needed to operate a well working IRB.
- MANY COMPONENTS

SAFETY EQUIP. HELMETS

- I hope these fit all sizes/ are adjustable to all sizes at least!
- Identified there is no difference between mens and womens helmets (probably expected to wear the same). Are they different sizes? might have to look into to understand.
- These look well maintained, maintenance is probab;y quite a constant and neccessary factor of IRB operation.
- I wonder how SLS women feel about the maintenance aspect, I assume sometimes men would 'just take over' for these tasks.
- Would be so cool to design a piece of safety equipment (Don't get your hopes up)!

SAFETY EQUIP. LIFEJACKETS

- This is a necessity for IRB driver (compulsory even in rescue situations).
- I wonder if these are annoying/ more annoying for the SLS women to wear. Do these lifejackets ergonomically fit the female body type?
- These seem pretty slimming/ fitting. Does this risk the wearbility of all users? Also it seems they don't have too much 'flotability', Does the design consider that lifeguards are normally confident in the water?

IRB TRAILER

- I know full well that this is a physically hard thing to tow. Normally done via ATV but also commonly done via lifeguards as the tide comes in and out.
- Need quite a but of pushing/ physicla power to transport these boats, is this a limitation?
- I understand that the trailers must be hauled up to get the boats onto the trailers near the shore (normally done by 2 people). What do SLS women feel about this step?

IRB STORAGE

- Are these too high? How do lifeguards get the top IRB's down? Are they heavy when they are deflated? How often do they have to be deflated?
- I assume getting them off these racks and onto what ever they need to next must be a such a strenuous task.
- I am intrigued with this step. I don't think it will anwser the problem but I do believe its that its an example of the inconsideration of femalers physical capabilities.

LIQUIDS CUPBOARD

- I have no idea what would be in here other than possibly WD-40? Fuels? Lubricant/ oil?
- I would not even know how to use or where to use it. The motor design relies on the users prior knowledge, it is not suggestive at all. Is there an opportunity here?
- Are the complexities of motor maintenance/ handling one of the biggest factors of females not participating? Are they potentially intimidated my motorsport/ motor function?

DRAINING AND WASHING

- From my own experience, I know these buckets are used to clean the motor and its insides (drain it from any debris in the propeller), I guess to also see if the motor is running well?
- I only know this information with prior years of experience and observation, but I wouldnt know how to actually do this. What I assume is that there is so much more to IRB operation than 'meets the eye'. Is this a reason why SLS women aren't attracted to it? I assume the engineering stigma and complexity of the SLS activity attracts more males than females.

Observational Workshop

I conducted the first workshop to observe IRB operating women setting up, using, and packing down existing IRB equipment in the facilities that RBSLSC had to offer. I recorded these moments to identify what aspects and areas of IRB operation the participants found physically difficult during a regular training procedure.

On this day, the surf conditions were flat and easy to operate in. The data collected and the experience of watching these women interacting with the equipment gave me the impression that the maintenance aspects are what women found most challenging. Without comparing IRB operating women to men, the participants seemed very capable of handling the boats on the water. Aspects of IRB's that required lifting were physically challenging for these women. I assumed that this gear's weight and height had not been ergonomically considered for all potential users.

I noticed that the participants were unconfident in specific IRB/ engine maintenance tasks when reflecting on this exercise. Some tasks they were hesitant even to attempt. This observation led me to believe that IRB maintenance/ engine maintenance was considered an intimidating/ overly complex duty. I decided to research further into this insight later in the research.

The participants operated the IRBs comfortably on the water. From what I observed from the shoreline, the most physically challenging duty 'on water' was the action of picking up a patient. My previous SLS experiences understand that IRB operating is a physically strenuous task (on the water) when the conditions are rough (i.e., large waves and choppy waters). Due to this particular day's conditions, I could not observe the physical challenges women face when operating in these conditions. I made sure to educate myself on the physically challenging aspects of IRB operating in rough conditions during the user interviews.

An awkward carry, see how much they are using the incorrect muscles for carrying a shared

Having to lift these bars over the transom, this seems like the difficulty of this task (other than the weight).

They do all of this in their wetties, does'nt it get hot?!

Small shared handle grip around steering bracket.

Secured!

The participant has let go of steering bracket here, not alot of freedom and hand space.

Toggles twist/ tighten to lock outboard to transom.

Look at the size of that thing!

Beware of the tiller, seems pretty annoying.

This is the front grab, under the cowling base.

Is this really enough 'grip' to carry such heavy equipment?

Certainly can be more ergonomic, not just for women, but for human.

Testimony that the motor is not designed at all to be carried. Really, are any?

Starting the motor in fresh water, to rinse the engine before use.

Notice how right hand is on tiller, is that really effective/ ergonomic?

Why is it not electric start?

Took 5 times to start.

Prop-guard lifted up not to catch sand/ damage the propeller.

Is there a reason why it can't touch anything? Do operators ever put it on the ground?

I saw them adjust something that is the tightness of angling, explore.

Heavy piece of equipment also, designed to prevent propeller contact. SS.

Lifting the trailer to get the IRB off and on, or to drain it.

Normally lifted up by two people, only by one here! 3 including the trailer mover. Is this system worth/ effective?

Can be very heavy, especially if filled with water, yet seemingly not as awkward as outboard.

BOOM! Hitting the wave.

The participants screamed as they dropped, not too big of wave. Surf navigation must have scary aspects? Who am I to know.

There is not much to design that is tangible / product to help operators with this fear.

Unpredictable, difficult and deep in rough conditions, these women went from knee depth water to chest deep (still controlling the IRB).

Those who are vertically challenged may find jumping in the boat difficult.

Must keep prop angles out of the water to prevent damage. Difficult to do! This is the operators job.

Took 2 times to start (warmed up).

Figure 22. Jenkinson (2020). Participants Lifting Outboard

Figure 23. Jenkinson (2020). Participants Starting Motor

IDEATION - Conceptualising Assumptions

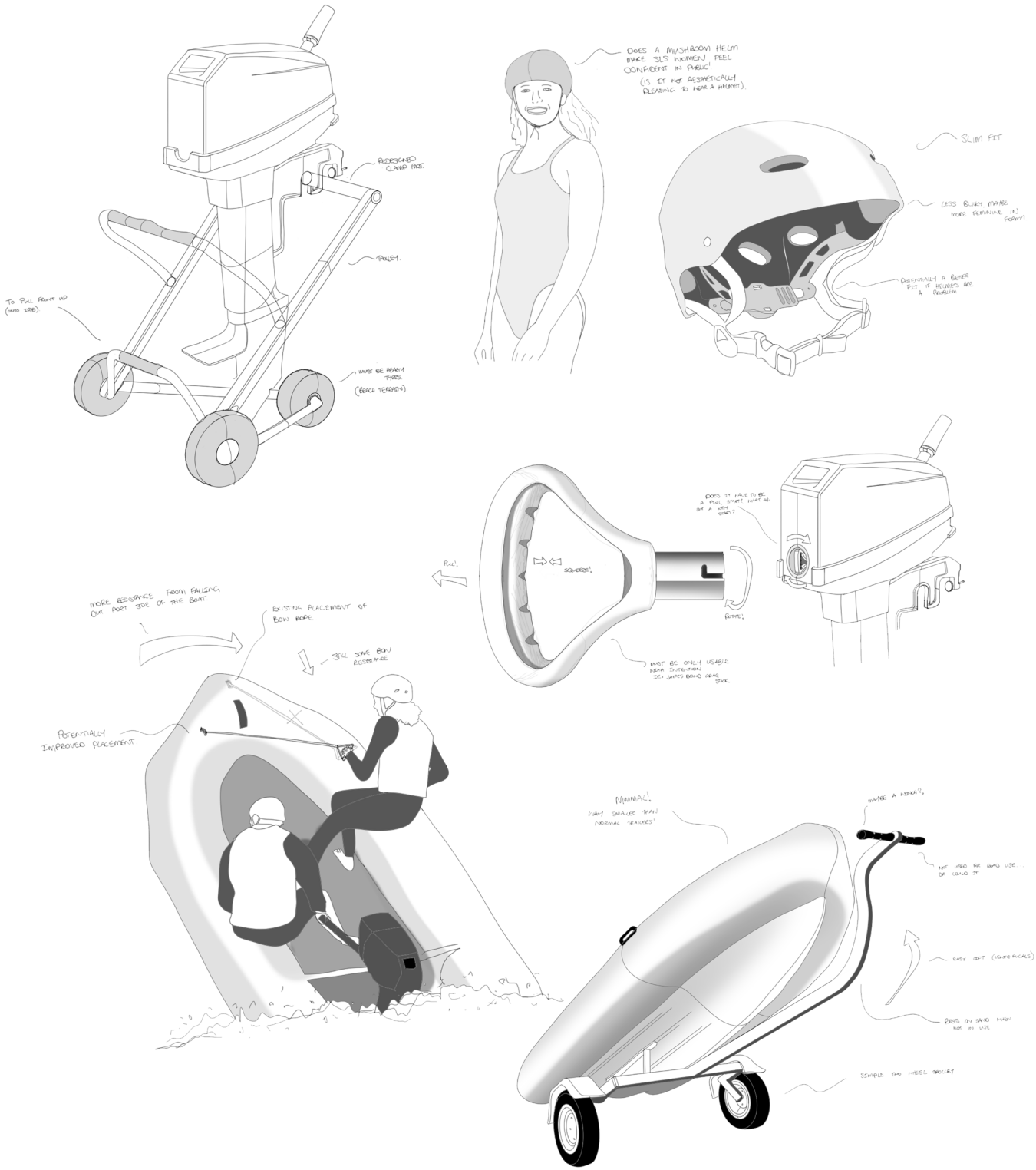


Figure 24. Jenkinson (2020). Assumption Sketches 1

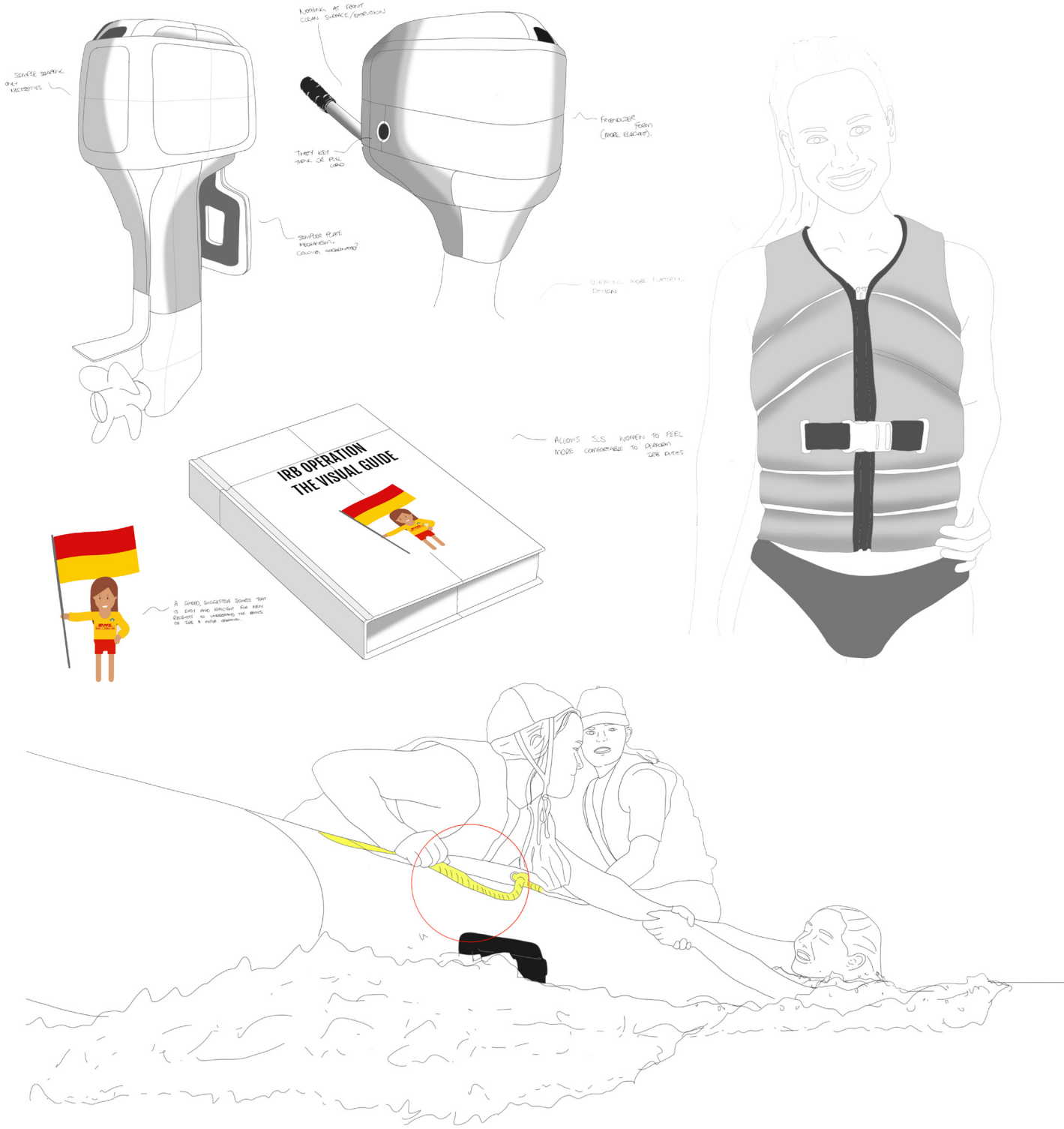


Figure 25. Jenkinson (2020). Assumption Sketches 2

CRITICAL ARTEFACT DESIGN - IRB ISSUES the Card Game

I wanted to create a safe space and healthy work relationship between researcher and participant. A critical artefact/ cultural probe was implemented in the Expert Interview sessions and was an effective method of data collection and team bonding. IRB ISSUES was the result of this cultural probe. The designed card activity provoked storytelling and experience sharing between a group of participants to help make palatable potentially sensitive subjects (i.e., specific areas of IRB's that women found physically or mentally challenging.)

I constructed the activity similar to a journey map. Using what I learnt from the observational workshop, I wanted a more detailed understanding/ a shared experience about each particular aspect of IRB operation. My goal was to identify which aspects negatively affected women who operate IRBs the most (either physically or mentally). Each card represented an action, piece of equipment or touchpoint involved in regular IRB operating duties. Action cards such as 'Starting the motor' and 'Hitting a wave' are examples implemented into the discussion.

I tested the game with my Master's cohort group and family (former surf lifeguards). The simplicity of the game made it very playable and flowed easily, resulting in a successful trial/s.

Figure 26. Jenkinson (2020). IRB Issues The Card Game

CRITICAL ARTEFACT DESIGN -Brief Summary of Card Game

Cards were shuffled and picked at random; as each card was displayed, participants were asked to share stories or experiences about these pieces of equipment or actions. It was advised that the stories shared could be a positive experience or negative; the main intention was to share memorable, relatable stories between the group. The stories shared acted as valuable data collected for my research.

After all the cards were played, I introduced my position as the researcher and shared my vision/ goal of this research project. This introduction was to contextualise and mentally prepare them for the next phase of the card game. Participants were then asked to order the cards from least to most in need of design attention (to positively impact female participation in IRB operation). The action cards most in need of design attention became areas of design focus and opportunity, collaboratively discovered by both participant and researcher.

Instructions were given via a card in the pack.

Figure 26. Jenkinson (2020). IRB Issues Results: Interview 1

USER INTERVIEWS

I conducted expert interviews with 5 participants. The participants consisted of Female Lifeguards, IRB operating women, IRB instructors, and a Women in Sport specialist with SLS experience. Using voice memo's, I recorded these interviews to analyse, reflect and compare those interviewed and their individual opinions. Although the participants came from different backgrounds, experiences, and ages, I was able to identify and highlight common themes to use as critical points that pave the way for design opportunities. Participant's insights are displayed as quotes to express the culture and voices of those I was interviewing.

Themes included: Male Dominance and Inequity, Facilitative/ Ergonomic Inconsideration, Operating vs Racing, Age, Physical Discomfort, and Mental Discomfort.

Male Dominance and Inequity

All participants interviewed expressed that IRB operation is a male-dominated sport. Participants described a hierarchical culture encompassed by those who engage in/ operate IRBs. In certain IRB maintenance tasks, the men will take it on themselves to do this work, not providing women with the opportunity to learn or achieve IRB related duties.

"The boys would take over" – 21-year-old IRB Racer, 1 Year experience.

Participants experienced situations where they felt physically and socially inept. This behaviour resulted in the female population of IRB recruits and existing operators feeling unequal and discriminated against. Some participants felt the men fear that the women may do something wrong or unlike how they would. This was especially evident in IRB maintenance.

Through these interviews, it became evident that women engaged in IRB operation may feel less able to participate due to a lack of other existing female mentors and peers (or role models). As stated by the women in sports specialist, the influence of others is a known, effective method of providing a feeling of confidence and competence to new sport participants.

"You can't be what you don't see" - Women in Sport Specialist.

Participants shared that there is more benefit to designing the equipment to be usable/ ergonomic than merely making the equipment lighter. It was also suggested that a drastic change of equipment design may intimidate the male community and may not be accepted by the IRB operating culture.

"Women may not feel comfortable/ confident asking how to lift the heavy pieces of equipment" – 20-year-old IRB Racer, 2 Years' experience.

Reflecting on this, I questioned how often and what other aspects of SLS women were limited to due to the fear of asking for information (especially in male-dominated areas).

Facilitative/ Ergonomic Inconsideration

A common thread discussed between all participants was if the existing facilities at SLS clubs were ergonomically appropriate for females. We questioned if these facilities and equipment were designed for use by men only (whom we acknowledge as typically more physically capable). If the facilities themselves (i.e., IRB equipment, Gear shed and safety gear) did not accommodate female lifeguards/ operators, it highlighted a physical reason why IRB was considered a male dominant SLS activity/ qualification. If IRB operation and its equipment were not designed to consider women, how can this community participate?

The participants expressed that the IRB gear shed is somewhat welcoming yet physically challenging to work in.

"Everything's heavy, hard to reach and hard to set up" - 20-year-old IRB Racer, 2 Years' experience

Aspects such as the motor's weight, the height of the transom, and height of storage (for this particular surf club) are aspects that all participants considered as physically challenging/ limits their capabilities to perform IRB maintenance duties.

Although now resolved, the participants reported past problems with safety gear (i.e., lifejackets and helmets). The lifejackets issued to IRB operators were inappropriate for women's body shape, resulting in safety gear being too large and/or too tight around particular areas of their bodies. The club participating in this research have since issued size XS helmets and more diverse fitting/ ergonomic lifejackets.

Age

The older participants expressed that their experience with men who operate IRBs (both instructing and training) was excellent. The men involved in IRB operation were inviting and glad to educate/ get these recruits in the boat no matter the gender.

The encouragement from the male community involved in IRB operation at RBSLSC was awesome. Without the enthusiasm and help from those instructors, I would not have passed, been involved, or interested." - 48 year old IRB driver, 2 years' experience

I perceived the club participating in my research with a good culture and attitude towards women and their involvement in IRB operation. The enthusiasm and support provided by these people have resulted in more than half of their newest recruits being young women (discovered and discussed during the interview).

Unlike the younger women, the older women who operate IRBs had fewer recruits their age participating in the course. Both women recalled being the only two females and people their age in the examination. Instructors were the influencers for them in this space. Influence from both men and women instructors/ operators may be a form of recruitment that other clubs are missing. An important difference between the participants was that the younger operators were IRB racers, while others were explicitly patrolling operators. IRB racing seemed to encompass a more male-dominant culture, differentiating the perspective of the activity between participants.

Lifesaving vs Racing

Two of the women I interviewed were IRB racers and gained their qualifications to compete in the SLS sport. These women perceived IRB racing/ operation as an unexplored area of SLS with less pressure and as a more social activity compared to competing in individual events/races. Existing IRB operating friends (both men and a few past women teams) influenced these women to participate in the SLS activity. They considered these operators as mentors and are inspired by their successes in IRB championships.

Those who gain their IRB qualification for other reasons (paid guards, experience, patrol captain responsibilities etc.) got into IRB operation were influenced by existing IRB operating friends or encouraging, like-minded lifeguards. The qualification provides guards opportunities to progress in SLSNZ. When observing IRB operation and racing for the first time, these women expressed that the “thrill and excitement” appealed to them. Unfortunately, the act of asking a peer or mentor about participating in this male-dominated area of SLSNZ was considered intimidating. Only through a strong and welcoming invitation from peers (instructors and friends primarily involved in the activity), they felt confident to try out IRB operation.

Physical Discomfort

A common trend was that the participants all struggled with the physical aspects of IRB operation, especially the maintenance aspects involving the IRB outboard. The interviewees consider themselves physically incapable of achieving certain physically challenging tasks the way men do. A particular participant conveyed an example of this during her IRB examination. Her examiner would not allow her to pass if she could not start the IRB only using one hand. Once she expressed that she was physically incapable and that 'getting to the patient quickly is more important than starting the motor with one arm', they allowed her to pass after a debate between examiners. The story shared was an example of women's physical capabilities being compared to men in the qualification/ sport. There was an opportunity to explore areas around the IRB outboard that women find physically challenging.
Surf Navigation and driving in big waves is a shared fear between many female and male operators, especially newcomers/ recruits training to get their qualifications. There was an opportunity to design a product that ergonomically considers IRB operators comfort in large surf. A product like this has the potential to impact a large population of IRB operators positively.

Mental Discomfort

An aspect that all interviewees most enjoyed about IRB operating was the thrill and speed of the boats. The women never ceased to acknowledge that they were physically marginalized compared to the men, yet they did not consider this unfair or a disadvantage; they recognise their physical limitations and work through them.

> *"Yeah, the boys are stronger and more capable, it just is what it is" - 21 year old IRB racer, 1 years' experience*

A weight decrease in the heavier pieces of equipment was seen as an obvious solution in pursuing the vision. All interviewees shared this opinion. Although, I did not see good in a lighter outboard (reason shared in the user interview summary). I discovered that women who operate IRBs are less enthusiastic and interested in IRB maintenance. IRB maintenance includes the setup and 'wash down' of the gear before and after use, and engine maintenance. Women who operate IRBs acknowledged engine knowledge and physical strength as an aspect of IRB operation they are not confident in. The ¬-participants expressed that IRB maintenance is regarded as an engineering-minded, labour intensive aspect of IRB operation that appeals to men more than women. Interviewees discussed a behaviour (encompassed by IRB operating men) that does not accommodate, appreciate, or acknowledge women as equal participants, doubting their physical and mental capabilities to perform particular IRB operating duties.

> *"The boys naturally think they know more about the engines, and most of the time, they end up taking over set up and pack down". 21-year-old IRB racer, 1 years experience*

An interesting insight that may counter this insight was discovered during an interview with a women's sports specialist.

> *"For women, knowledge is confidence". - Women in Sport Specialist*

Confidence can allow women to participate in these aspects of IRB operat ion, and feel capable in doing so. I assume that their lack of confidence results from men who operate IRBs not providing these women with the opportunity to learn and successfully achieve IRB maintenance tasks.

When asked, “What makes rescues/racing dangerous or risky (for the boat crew)”? A common trend expressed was that surf navigation is the scariest aspect of IRB operation. Positioning of the body and timing of hitting a wave is considered a risky, challenging, and sometimes dangerous task to achieve safely. Both Experienced and trainee lifeguards struggle with this aspect of IRB operation. Designing a product to ‘make waves smaller’ corresponds well with the idea to make IRB equipment lighter; although effective, it does not unpack a problem of gender equity.

CRITICAL ARTEFCT- Summary

The critical artefact validated some of my assumptions and helped me correct others while highlighting areas of IRB operation worth exploring/ focusing on. The primary outcomes of the critical artefact were...

- Surf Navigation and IRB outboards were considered the areas of IRB operation that mentally and physically affected participants the most.
- There were stories and evidence of male-dominant culture/ female discrimination in IRB operation recently happening.
- Wearables (Lifejackets and Helmets) were not seen as an issue. SLSNZ is slowly accommodating women in this safety gear.
- The heaviest lifting aspects (that IRB operating women struggle with the most) of IRB operation are actions surrounding the motor and the IRB trailer.

USER INTERVIEW - Summary

In reflection, I gathered common insight and trends shared between the interviewees. The insights include:

- Behaviour/ culture change trumps a physical change in design in this study.
- An effective product impacts the users psychologically and socially equally as much as physically/ ergonomically.
- A more ergonomic/ suggestive product allows women to perform IRB duties without the intimidation of/ need to ask IRB operating men how to do so. Correspondingly, this kind of product gives women confidence in achieving these tasks and will decrease the action of 'boys taking over.'
- IRB operation in the surf club I am working with is well encouraged to all genders equally. How can industrial design implement this behaviour to other clubs?
- The desired result is for SLS women to feel confident/ competent in all aspects of IRB operation.
- The complexities/ physical awkwardness of the IRB outboard and fear of surf navigation are two areas of IRB operation that affect SLS women the most; there is an opportunity to focus on this aspect and piece of equipment.
- The solution should be a more 'suggestive to use' design update or additive rather than a redesign/ change of existing equipment, eliminating feelings of unacceptance from the existing, predominantly male, IRB operating community.

EXPERT INTERVIEW- Discussion with IRB Instructor

This interview aimed to understand what inexperienced IRB operators and trainees find difficult when introduced to the activity. We first discussed that the IRB motor was the main piece of equipment that lifeguards find difficult. The heavyweight, complexity of use, and the maintenance involved with the IRB motor are aspects where this community struggles.

SLSNZ uses a 30HP Mercury outboard for their IRB's. These motors have a dry weight of approx. 51kg and are not designed to be carried. Recreationally, outboards are not removed from the transom often. Lifeguards separate the outboard and IRB after every use for maintenance and longevity of equipment. The existing IRB motor was considered awkward, heavy and not easy to transport correctly/safely. Carrying an IRB outboard requires two people holding both the steering bracket and cowling (figure of parts found in contextual review).

Motor use and maintenance is an aspect of IRB operation that is introduced early in the qualification. Setting up and packing down the IRB is labour intensive and is perceived as a chore. Maintenance is crucial to the longevity and efficiency of use in surf rescue. The motor will cease functioning without proper maintenance due to ongoing degradation from salt and sun (a common problem for outboards). The inflatable rescue boat requires frequent and regular set-up and wash down.

"Well cared for gear means better working IRBs for longer" – IRB Instructor.

New IRB operators are most intimidated when experiencing big waves. Operating IRBs in big surf is considered by lifeguards as "physical, fast and rough". Trainees "learn by doing" and are often encouraged to operate in large west coast surf during their course. Surf Navigation takes many years and experience in large surf to become confident. Surf Navigation and driving in big waves is a shared fear between many female and male operators, especially newcomers/ recruits training to get their qualifications. There was an opportunity to design a product that ergonomically considers IRB operators comfort in large surf. A product like this has the potential to impact a large population of IRB operators positively.

Another aspect that intimidates trainees is the act of picking up patients. This skill was introduced in the bronze surf lifeguard course. Physical aspects such as patient weight, the strength of the crewman, and the driver's skill affect patient retrieval success. There is no particular or set method of picking up a patient as there are many. The responsibility of picking up a patient and operating in dangerous conditions can lead to an intimidating experience for both operators. At present (2021), no design helps/ accommodates trainees for the most intimidating aspect of IRB operation. I aimed to explore what aspects of surf navigation are most scary and how industrial design can help inexperienced IRB operators feel safer and more confident in big surf.

Lastly, the existing IRB manual is considered ineffective and not used when questions are raised from inexperienced trainees. IRB manuals are provided to all qualifying crewmen and drivers at the start of their qualification. In reflection on this insight, I saw an opportunity to discover why new trainees choose not to use this manual and how it can be improved to educate and give confidence to new IRB operators.

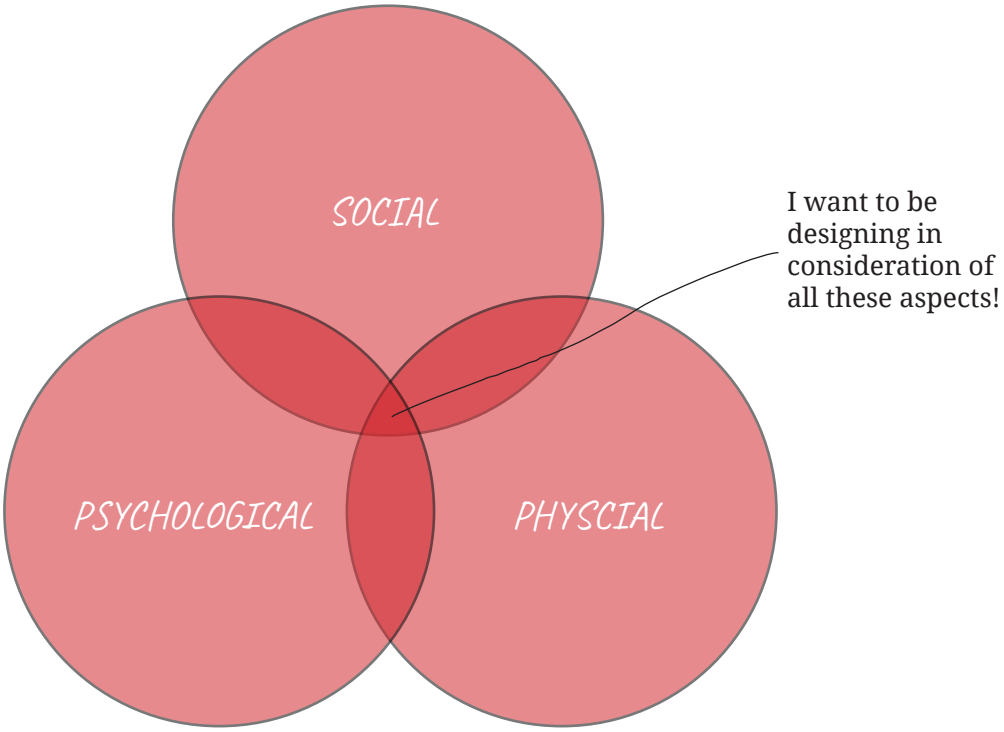
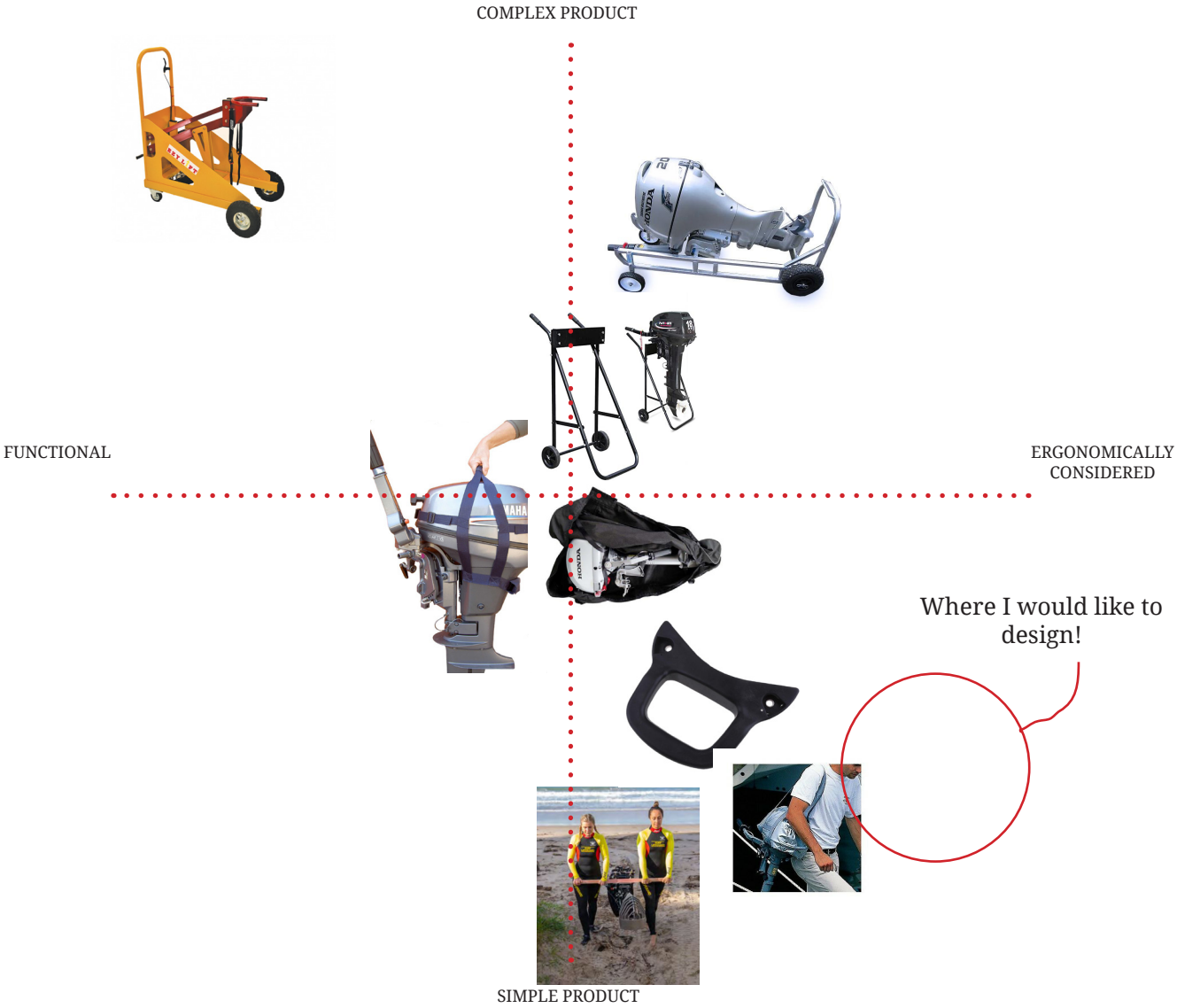


Figure 27. Jenkinson (2020). Theoretical Framework Update

THEORETICAL FRAMEWORK REFLECTION

Interviewing the Women's Sport specialist/ expert provided insight and restraint into what aspects I should consider when designing for females in sport/ IRB operation. Designing with physical, social and psychological consideration will help unpack and highlight potential risks/ design flaws. The theoretical framework presented below has helped me adapt my biases and design lens to a more effective/ objective view towards this area of SLSNZ. I intended to sieve my ideas and developments through this collaboratively produced framework and ask myself questions around these three main considerations.



EXTERNAL PRODUCT ANALYSIS

I did an external product analysis to discover existing attempts of solving the outboard carry issue. I noticed from this exercise that there are not many products designed to solve this issue, validating my assumption that outboards are not meant to be taken on and off often. Seeing where existing products lie in this map allows me to understand a design opportunity/ where I would like to focus. The parameters chosen in this chart (by the IRB racing participants and I) were considered aspects often seen in existing IRB operating equipment. The goal of this chart was to identify an area that would be most effective to design towards.

ROLEPLAY

Roleplaying allowed me to firsthand experience the tasks and difficulties of an IRB rescue simulation. Reflecting on this roleplay session, I discovered that this session and the data collected allowed me to further empathize with women who operate IRBs. My roleplay consisted of participating in a training session with these women, performing the duties required to maintain and use IRB's. I was unable to operate the IRB's, although I was able to drive as a crewman. The crewmen's responsibility is to communicate to the IRB driver about surf navigation routes, keep the boat balanced and pick up the patient/s (IRB Training Manual, 2018). An IRB crewman is another IRB qualification that is less intensive and takes a much shorter time to gain. The roleplay involved setting up the IRB, performing rescues as both the crewman and patient and packing down the IRB (a generic training for the average IRB operator).

Figure 28. Jenkinson (2020). Roleplay Exercise Capture 1

Setting up

Straight away, I was faced with dragging and lifting heavy equipment. Transporting an IRB motor from a rack (a large block of timber holding other engines) to the IRB transom was awkward, and I realized that I had no idea how to lift the design until informed how to do so correctly. Straight away, I saw a design opportunity that deserved HCD attention here. The most awkward part of this carry was lifting the design onto the transom. The transom is the area where the motor is secured to the boat. The lift onto the transom was physically awkward and straining. I felt as if I could never lift it high enough. I can only imagine the physical strain of this aspect on those shorter and less physically capable than myself (6ft tall, fit male).

The other tasks seemed achievable without too much physical strain. Assumed challenging aspects such as the 'pull start' were not as much of a struggle on land as anticipated. Operators can adjust the tightness of the outboards tilting action. The IRB Manual (2018) states the Benefits of a correct tilt adjustment include the IRB being easier to drag on the beach, reducing the impact on the transom, and reducing stress on the swivel bracket. This also was considered an easy task and was a relatively effortless adjustment. Reflecting on this, I questioned if there is a preferred tightness and if it differed between females and males' physical capabilities. "It's different for everyone", one of the participants replied, validating the idea that this equipment adjustment does not require ergonomic design attention.

Once near the shore, the trailer and IRB are separated. In reflection, this task was labour intensive and seemingly unnecessary/can take on a considered system improvement. Lifting the trailer and IRB on its wheel axis (bow pointing towards the sky) required more than three people. There was an opportunity to design a system or product that allows this action to be achieved physically, more efficiently. This aspect was surprisingly difficult compared to the lack of attention it was received during my interviews and critical artefact.

Figure 29. Jenkinson (2020). Roleplay Exercise Capture 2

Operating on Water

This day's conditions were calm, a common term of events for the surf club involved, and its surrounding coastline. I performed both as a rescuer (IRB crewman) and patient during this roleplay rescue simulation. As the rescuer, most of the experience was physically comfortable. This was due to the kind conditions and an experienced racing patient. The action of lifting the patient into the boat was easy for both the participants and myself (with the additional help of an experienced IRB driver). The responsibility of being the rescuer (the act of picking up a patient) was mentally intimidating. I felt unsure of where to be on the boat at certain times. I needed reminding of the preferred/ correct method of pulling the patient up and into the IRB. Fortunately, I have experience operating IRBs as a crewman in large conditions, although I cannot comprehend the feeling of rescuing a patient in large surf. I can only imagine the heightened fear, difficulty and responsibility guards receive when retrieving a patient in rough conditions.

Pack Down

After participating in the training, the participants and I were physically fatigued. This fatigue affected our capabilities to lift, grip and perform the duties to pack down the gear properly. Pack down was essentially the reverse of set-up with the addition of rinsing the equipment with fresh water. The most physically demanding aspect (not stated in the set-up phase) was draining the IRB of water; this was done before we loaded the IRB onto the trailer. I discovered that a wet IRB is a heavy IRB. Pack down duties were a struggle and tedious due to our physical and mental exhaustion.

Figure 30. Jenkinson (2020). Roleplay Exercise Capture 3

ROLEPLAY - Summary/ In the Shoes of Women who Operate IRBs

This Roleplay exercise gave me insight into the physical and mental struggles of IRB operators. I discovered an awkwardness and lack of ergonomic design attention across an array of IRB equipment previously in my studies; this workshop validated these assumptions.

I was open yet confident going into the workshop, knowing that my physical ability and prior knowledge of IRB operation would result in a smooth/ predictable experience. My preconceived assumptions and mindset changed when performing the more physical tasks/ duties (such as my experience with the motor) within IRB operation. I found that moving the outboard motor was awkward and heavy, making the experience uncomfortable and intimidating. The physically intensive/ awkward tasks involved the IRB outboard.

IRB maintenance and preparation consist of a more tedious set of tasks with little satisfaction compared to the action of performing a rescue (after observing the participants and experiencing these duties myself). I could relate to what the IRB instructor expressed, “IRB’s is 80% maintenance”. These necessary duties felt like chores at home. Women who operate IRBs responded similarly towards this aspect of IRB operation. The maintenance tasks were most tedious after the training session when your body is cold, wet, and weak. I considered packing down as a much more strenuous set of tasks compared to setting up. I can understand why women (and some men) commonly neglect these tasks.

Performing rescue scenarios and operating IRBs on the water are exciting experiences. The speed, beautiful location and excited nature of the participants helped make this workshop a fun experience. The lack of waves and danger did not alter IRB operation’s thrill for a newcomer like me. A surprising aspect of the operation phase was how rough and mentally/ physically straining the activity can become (even when operating in calm conditions). Sitting in the crewman position is a physical strain on the body. I did not notice the physical toll on me until after the training.

I learnt that this driver’s skill and experience positively affect the ease of picking up a patient. The participant I rescued was light and was also experienced as a patient in racing (not representative of a standard beach rescue). In summary, the insights gathered helped confirm that I should focus on how to resolve the more intimidating and physically challenging aspects of IRB operation that affect newcomers to the qualification. The newcomers (to IRB operation) will include both men and women. Yet, I still believed that designing for women who operate IRBs would better the functionality and ease of use for a more extensive range of potential users.

Figure 31. Jenkinson (2020). Roleplay Exercise Capture 4

JOURNEY MAP

I produced a journey map in the wake of the observation workshops and Roleplay. I used the data and photographs collected from the workshops to explore the main areas of design opportunity. The journey of setting up, operating, and packing down IRB's (operation and maintenance) were recorded in the workshop and analyzed through the journey map. Mapping helped me contextualize and understand the complex and numerous actions needed to perform these IRB duties. I mapped the moments that the participants found most difficult or physically challenging. With each journey/ duty mapped out, I focused on specific aspects of each task.
While journey mapping may be an effective method of discovering and highlighting the aspects of IRB operation that are physically challenging, the moments where these women feel discriminated against or incompetent are can only be assumed in this exercise.

Figure 32 . Jenkinson (2020). Journey Mapping Exercise

PERSONA

Age: 20

Gender: Female

IRB Experience: New to IRB Operation and was influenced by her boyfriend to try it. She found a liking to it as she enjoys ‘being out of the water and the speed of the sport’. After gaining her first aid level 3, she discovers how she can improve as a lifeguard so she is more applicable for patrolling as a paid guard over summer. She is one of the two female teams at her club involved in IRB racing. She acknowledges and enjoys that there is little competition in her SLS region.

‘Big waves are not fun to IRB in’, she prefers a flat day on the water and sometimes feels unconfident when driving an IRB in surf. Other than knowing how to use the motor, she has little knowledge of the ‘up keep’ and maintenance the motor and IRB requires to function properly. She leaves this aspect of IRB operation to the boys who prefer to do it themselves anyway. She enjoys IRB racing and the social aspect of the sport, although she doesn’t like how the boys ‘take over’ as she knows she is capable of everything they are. She wonders why her female friends (who dedicate their time to individual competitions) are uninterested in IRB operation as it is a much ‘chilled out and fun sport to be part of and qualification to have’.

Age: 45

Gender: Female

IRB Experience: Interested in IRB operation, this woman was interested in participating through the influence of IRB instructors (whom she considers friends). Her husband is a recreational fisherman, yet is not involved in SLS. IRB operation stuck out to her because she considers herself knowledgable of boating and surf craft (from her husband).

She is not interested in racing, although she does want to be responsible for, and able to take out the IRBs when appropriate to. She understands IRB maintenance, yet rarely does much of the upkeep. The IRB racing men and instructors normally undergo these tasks. She is the only recuit her age training for this qualification. She is 1 of the 3 female recruits, both aged 17. The other 17 year olds relate and consider this woman their mother in IRBs.

She was surprised by the physical aspects of IRB operation, although continued her qualifiction because she already started. She is not ophysically capable for plenty of the tasks, even finding ‘getting in’ a struggle. She is able to do these tasks, yet feels physically marginalised.

Age: 17

Gender: Female

IRB Experience: She has been involved in surf club since a very young age. When finishing her schooling year, she wanted give something new a try. Her SLS friend and herself (only just recieving their bronze surf lifeguard award) decide they want to join IRB operation because they did not consider individual events fun anymore. They looked for a fun outlet that they participate within SLSNZ.

They liked the thrill and excitement of IRBs. When asking about the qualification, they noticed that the sport was populated with boys. Intimidated, they were about to give up until the instructor informed them of the womens crew. They hung onto this knowledge and crew as rolemodels for this sport.

They do not consider themselves different to the boys, and are happy to get stuck in. They enjoy teh IRB qualification more now that they feel more confident and competent in achieving IRB tasks with the boys.

SELECTING A DIRECTION

After gathering critiques from my peers, I was confronted with my position in this project. Transportation of the motor, Surf navigation in large conditions, and awareness/ encouragement of female guards (via IRB instructors) were observed, studied, and worthy of design outcomes. I believed that each of these issues could be resolved and positively impact female participation in IRB operation.

Previously wanting to create design outcomes for all three issues, my peers reassured me that my research position was as an industrial/ product designer. I realised that some of these design ideas would be better suited to those more experienced/ equipped with the proper knowledge, e.g., graphic designers, sociologists, etc. Based on my time frame and position in this research, I decided solely to pursue the outboard transportation issue. Out of the three discovered problems affecting women in IRB's, this issue would benefit most through an industrial design outcome.

It was clear that this aspect was considered physically challenging and mentally tedious. Other than surf navigation, IRB outboard duties/ knowledge revealed itself as a particular issue women face that could be improved through ergonomic design.

On reflection of the research I underwent, I now understood that IRB outboards are considered heavy, awkward, loud, and complex pieces of equipment. There was a hunch that the IRB operation has a cultural issue of gender equity/ male dominance. The existing IRB outboard design is not designed with consideration of potential female users. Research showed that IRB operating men 'take over' these particular tasks, resulting in the women involved in IRB operation feeling they are not strong or smart enough to understand/ operate an IRB motor. This behaviour fails to provide women with the opportunity to become confident and competent in IRB outboard use and IRB operation.

Analysing this discovery, I chose to focus my research on issues around the IRB outboard and conceptualise solutions to them further in the study.

INITIAL DESIGN BRIEF

To conclude my chosen decision of direction, I produced a design brief. The brief was devised to act as a checklist in my future design developments. It allowed me to gather the most valuable information from external participants and focus on how I can tackle this issue.

Purpose:

- Support women in IRB operation through ergonomic design.
- Improve the method of transporting the motor.
- Build confidence and competence in women interested in and operating IRB's by making physically challenging tasks accessible?

Performance:

- Easy to assemble/ disassemble.
- Able to move the IRB outboard comfortably.
- Be usable by a range of guards (lifeguards) with different body sizes and strengths.
- Be durable for the harsh conditions in which it will be used.

Social:

- Be readily accepted by IRB operators.
- Provide women with independence and demonstrate how they are capable and competent in all IRB related duties.

Cost:

- Be low cost for a public-funded organization.

Design

- Be ergonomic.
- Function well.
- Satisfying to use.
- Not ‘get in the way’ during operation.
- User friendly.
- Facilitative to most body strengths and types.
- Minimal/ Simple.
- Suggestive to use

Manufacture:

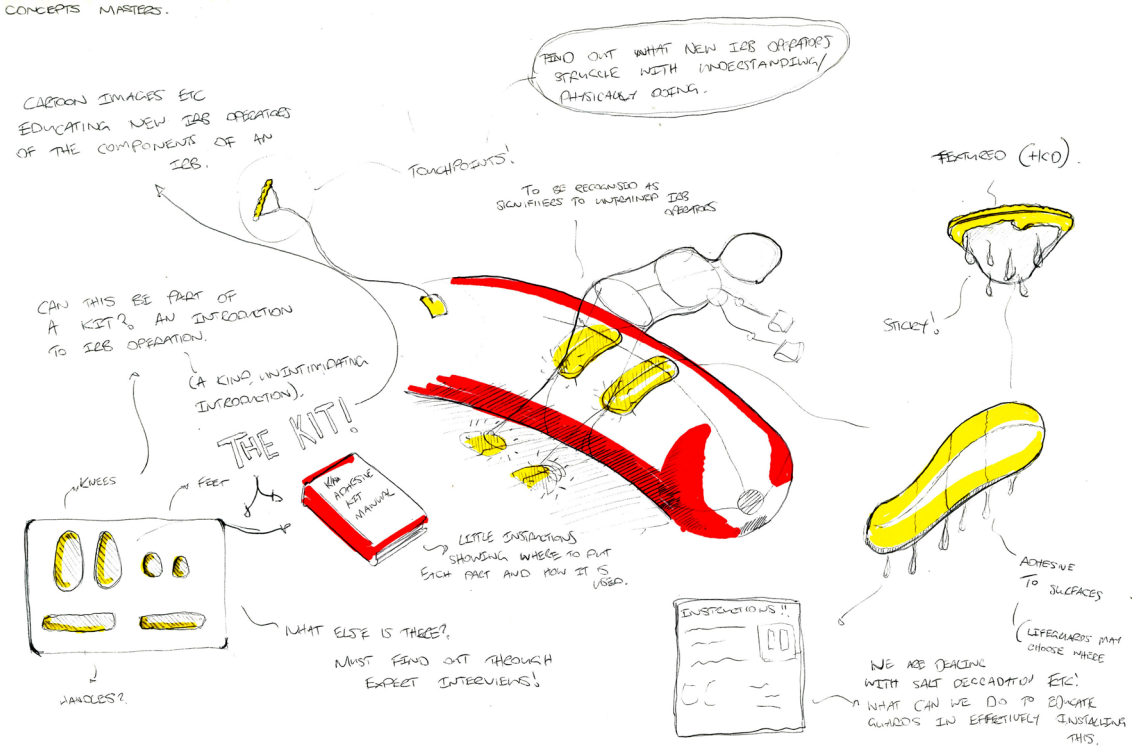
- Able to be duplicated through an effective manufacture process.
- Simple, and preferably low cost to manufacture methods without the need for specialized equipment.

Figure 33 . Jenkinson (2020). Lotus Blossom Exercise

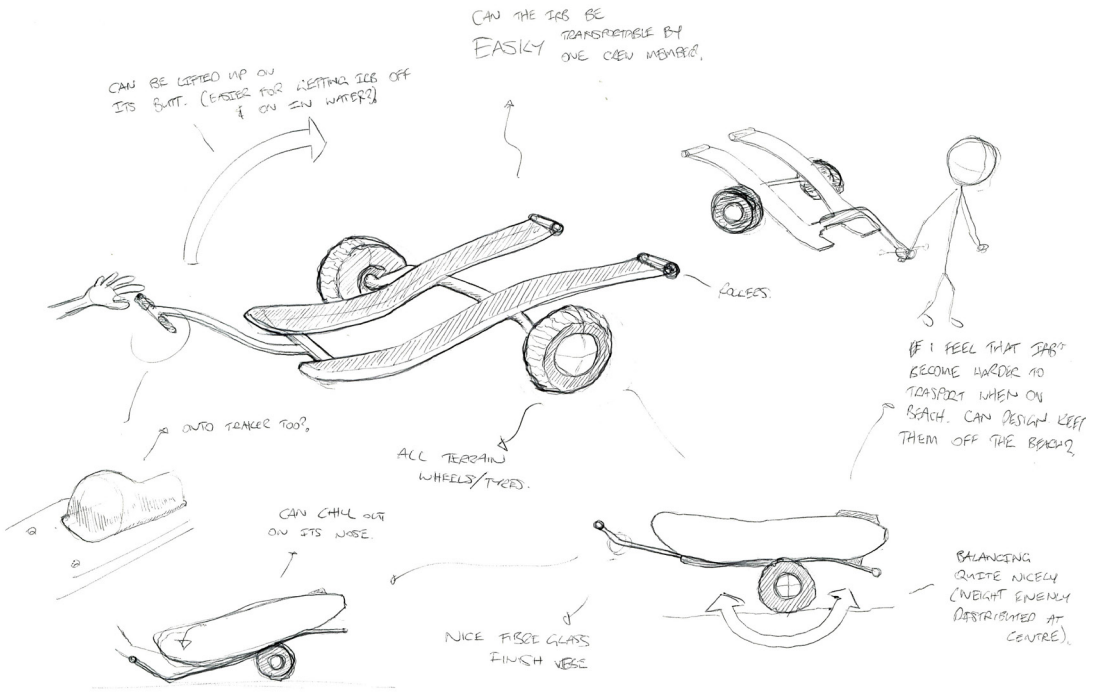
LOTUS BLOSSOM

Identifying that this aspect of IRB operation affects female participation physically and mentally, I produced numerous ideas that improve the physically and mentally straining tasks surrounding the IRB outboard. The design solutions included both unrealistic and feasible outcomes; I considered this exercise a ‘brain vomit’ of ideas.

CONCEPTS MASTERS.



IRB DESIGN CONCEPTS.

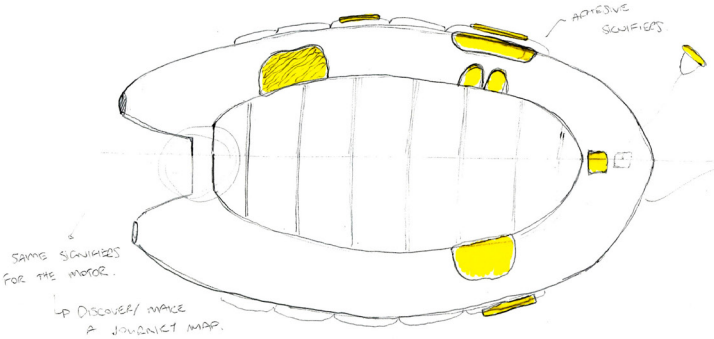


UNDERSTANDING SURF NAVIGATION

* UNDERSTANDING WHERE TO GET IN.
* WHERE TO GRAB TO SECURE YOURSELF IN THE BOAT.
* WHERE TO BE POSITIONED WHEN THE BOAT HITS A WAVE (SAFEST POSITION).
* WHERE TO BE WHEN PARALLEL RUNNING (AND UNDERSTANDING IT ALSO).
* WHERE TO BE WHEN APPROACHING PATIENT (AND HOW TO)
* HOW TO SUCCESSFULLY PICK UP A PATIENT THE EASIEST AND MOST AFFECTIVE WAY.
* WHERE TO BE WHEN FALLING DOWN WAVE (BACK INTO SHORE)
* WHERE TO BE WHEN REACHING THE IRB

HOW CAN HCD ALLOW THESE FEARFUL ASPECTS OF IRB OPERATION TO BE LESS FEARFUL

↳ USING SIGNIFIERS, HOW CAN DESIGN GIVE CONFIDENCE & COMPETENCE TO IRB OPERATING WOMEN?



↳ DISCOVER/ MAKE A JOURNEY MAP.

CAN I REDESIGN THE PONTOON? NOT TO CHANGE THE FORM, BUT CAN I CHANGE THE AESTHETIC TO FIT/ HELP TEACH A NEW RECRUIT SO THEY ARE MORE COMFORTABLE DRIVING THE TRAINER.

(A TRAINING PONTOON)

IS IT A CHARLOTTE DICKSON "LIN SCEALS HER ARM" SORT OF DEAL?.

(MORE GRAPHIC).

"A MORE UPDATED VERSION OF THE EXISTING IRB MANUAL THAT IS MORE INTERACTIVE & EDUCATIONAL".

INCLUDED IN A KIT WITH SIDE PRODUCTS FOR THE IRB TRAINEE AND/OR CLUB

"WHAT IS NEEDED TO LEARN/QUALIFY AS AN IRB OPERATOR? CAN I DESIGN A PRODUCT ALONGSIDE THE QUALIFICATION?"

I SEE A PACK OF 3 BOOKS

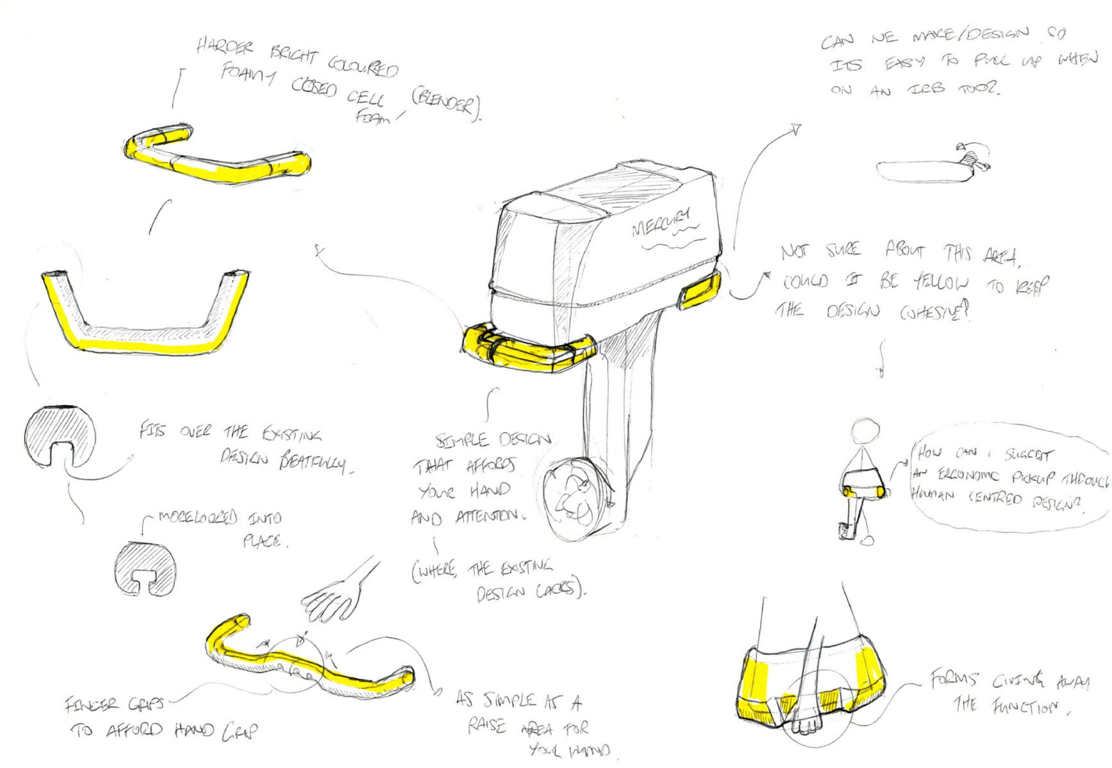
ALL WITH SMALL PRODUCTS CORRESPONDING WITH EACH STAGE TO HELP THEM GET INTRODUCED TO IRBS IN A FUN, LESS INTIMIDATING WAY.

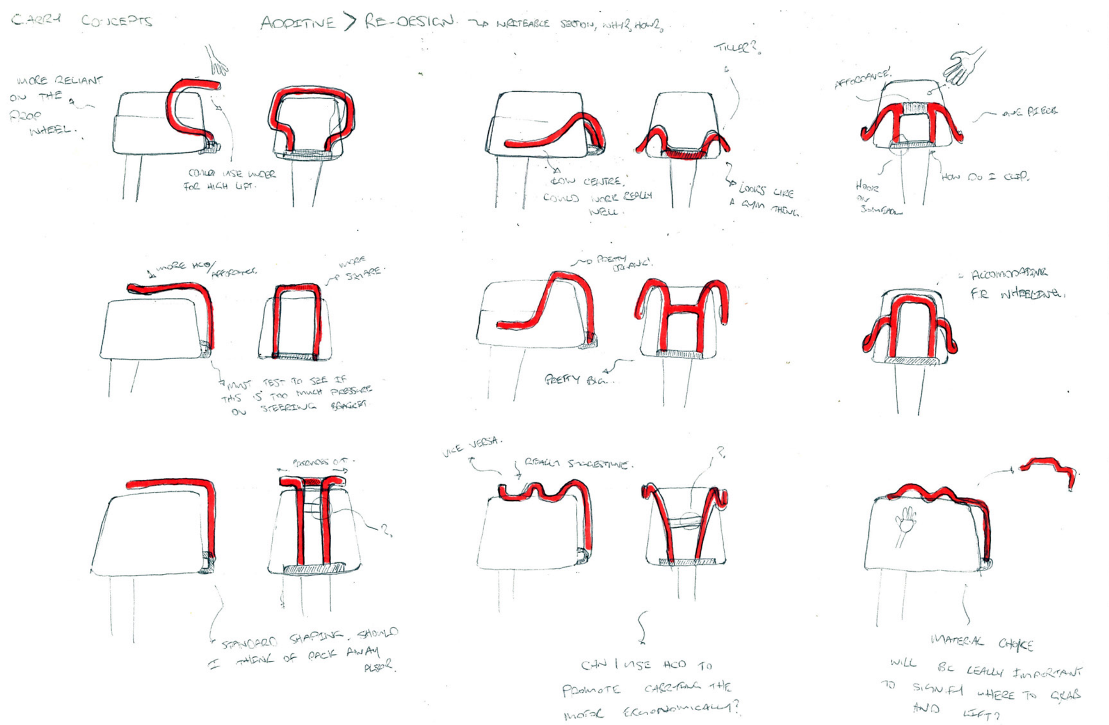
CAN I READ THE MANUAL?. IS THIS TO MUCH TO CHEW?.

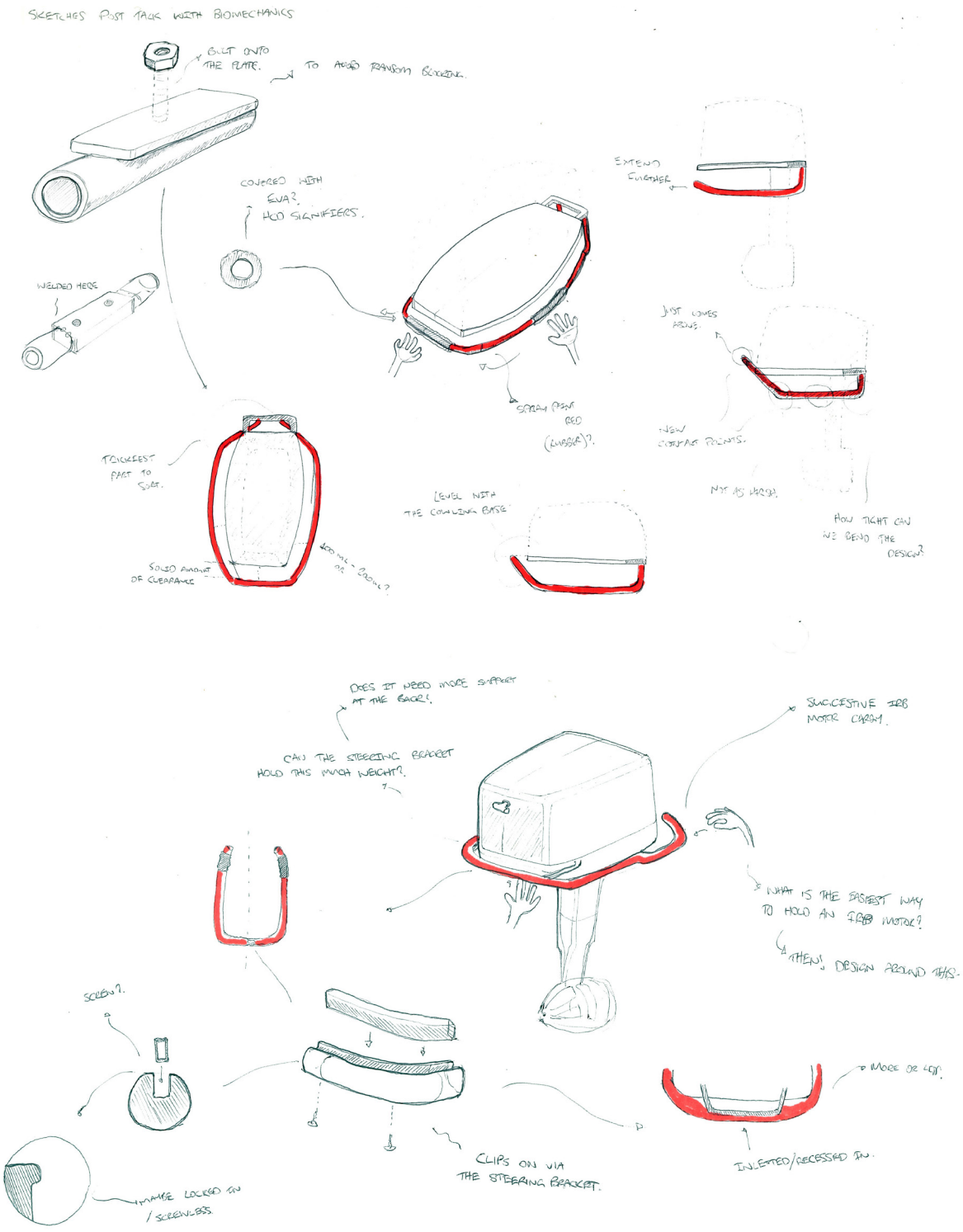
WHAT DO NEW RECRUITS FIND THE MOST DIFFICULT TO DO?.

WHAT DO NEW RECRUITS FIND THE MOST DAUNTING/ MOST INTIMIDATING?.

WHAT DO THEY NEED TO LEARN (ASK ROSS)?.


HARDER BRIGHT COLOURED FOAM / CLOSED CELL FOAM (BLENDER)
CAN WE MAKE/DESIGN SO ITS EASY TO PULL UP WHEN ON AN RIB TOOR.
MERCURY
NOT SURE ABOUT THIS AREA, COULD IT BE YELLOW TO KEEP THE DESIGN COHESIVE?
FITS OVER THE EXISTING DESIGN NEATLY.
SIMPLE DESIGN THAT AFFORDS YOUR HAND AND ATTENTION.
(WHERE THE EXISTING DESIGN LACKS).
HOW CAN I SUGGEST AN ECONOMIC PICKUP THROUGH HUMAN CENTRED DESIGN?
MORE LOCKED INTO PLACE.
FINGER GRIPS TO AFFORD HAND GRIP
AS SIMPLE AS A RAISE AREA FOR YOUR HAND
FORMS GIVING AWAY THE FUNCTION.


CARRY CONCEPTS
ADDITIVE > RE-DESIGN
MORE RELIANT ON THE PROP WHEEL.
TILLER?
AFFORDANCE!
LOW CENTRE, COULD WORK REALLY WELL.
LOOKS LIKE A GYM THING.
HOW DO I CLIP.
ACCOMMODATING FOR WHEELING.
PRETTY BIG.
MUST TEST TO SEE IF THIS IS TOO MUCH PRESSURE ON STEERING BRACKET
VICE VERSA.
STANDARD SHAPING, SHOULD I THINK OF RACK AWAY FLOOR.
CAN I USE HCD TO PROMOTE CARRYING THE MOTOR ECONOMICALLY?
MATERIAL CHOICE WILL BE REALLY IMPORTANT TO SIGNIFY WHERE TO GRAB AND LIFT?


SKETCHES POST TALK WITH BIOMECHANICS
BUILT ONTO THE PLATE.
TO AVOID RANSOM BOLTING.
COVERED WITH EVA?. HCD SIGNIFIERS.
WELDED HERE
EXTEND FURTHER
JUST COMES AROUND.
NEW CONTACT POINTS.
NOT AS HARSH.
HOW TIGHT CAN WE BEND THE DESIGN?
SPRAY PENT ROD (RUBBER)?.
TOUCHIEST PART TO SEAT.
SOLID AMOUNT OF CLEARANCE
LOOP ONE - GROOVE?
LEVEL WITH THE COWLING BASE
DOES IT NEED MORE SUPPORT AT THE BACK?.
CAN THE STEERING BRACKET HOLD THIS MUCH WEIGHT?.
SUGGESTIVE IRB MOTOR CURVE.
WHAT IS THE EASIEST WAY TO HOLD AN IRB MOTOR?
THEN, DESIGN AROUND THIS.
SCREW?.
MORE OR LESS.
IMAGE LOCKED IN / SCREWLESS.
CLIPS ON VIA THE STEERING BRACKET.
INLETTED/RECESSED IN.

PROTOTYPING

Outboard Struggles

Since the early iterations of this research, I tried to source a 30hp outboard to use. In an attempt to find one to design on/ with, I reached out to numerous IRB experts and clubs asking for an old IRB outboard. Unfortunately, IRB motors are not as easily given out as anticipated, and each club was hesitant to allow me to borrow an outboard. I explored trading websites, yacht clubs, marine wreckers, and outboard repair shops to resolve this. I was unsuccessful in obtaining a 30hp outboard (either broken or functioning) for a price feasible to this project.

Makeshift Outboard

I designed a mockup outboard that was approximately the same body mass and weight as an IRB outboard. This mockup was produced to test and communicate the idea/s with the participants during our collaborative/ reflective workshop sessions. Unable to borrow an outboard steering bracket (show a picture), I fabricated a makeshift bracket. This project focuses on the steering bracket as one of the rare areas I can design onto without damaging other parts of the Mercury 30HP.

This phase intended to create designs that were testable by myself and with willing cohort peers. The designed product had to be understandable and straightforward from the observer.

The mockup outboard was designed to house numerous weights that mimicked the weight of an actual outboard motor. The weights were scavenged from an old multi-gym and were stackable. I fabricated the prototypes out of 24x2 precision steel tubing. The desired forms were produced by either bending or welding the tubing together. The steering bracket acted as the anchor/ attach point for all the designs created.

Figure 34 . Jenkinson (2021). Makeshift Outboard

Materials

Using my tacit knowledge, I knew that the prototypes' materials would need to be durable and withstand forces acting upon them when participants operate IRB's/ interact with the prototype. Therefore, prototyping was a more strenuous process than working with foam or clay to test design ideas. Prototyping became vital as I struggled to obtain an IRB outboard to design onto/ with. A 'mock-up' of an outboard produced from cheap materials and 3d prints of important/ complex parts helped resolved this obstacle.

My tacit knowledge expressed that it is common for IRB equipment to degrade because of the environment it functions in. Factors such as salt and sun degradation impacted material choice and design direction. Prototyping and material research helped determine if the prototype could handle the environment's extremities and assess the ergonomics of the design used by women who operate IRBs. Many materials were researched throughout my research project to find out which would be most durable and comfortable to interact with.

Through the ideation phase, I was suggested to use a black general-purpose pipe (black pipe). Black pipe is a low cost, malleable steel piping that was adequate for bending, welding, and testing ideas. This material was used consistently throughout the prototyping stages until the final prototype/s.

Figure 35 . Jenkinson (2021). In the Workshop

RAPID PROTOTYPING WITH PIPE

Concept 1.

Concept 2.

Figure 36 . Jenkinson (2021). Annotations of Prototypes Image 1

Concept 3.

Concept 4.

Figure 37 . Jenkinson (2021). Annotations of Prototypes Image 2

Concept 5.

Concept 6.

Figure 38 . Jenkinson (2021). Annotations of Prototypes Image 3

Concept 7.

Figure 39 . Jenkinson (2021). Annotations of Prototypes Image 4

Concept 8. (Crowd Favourite)

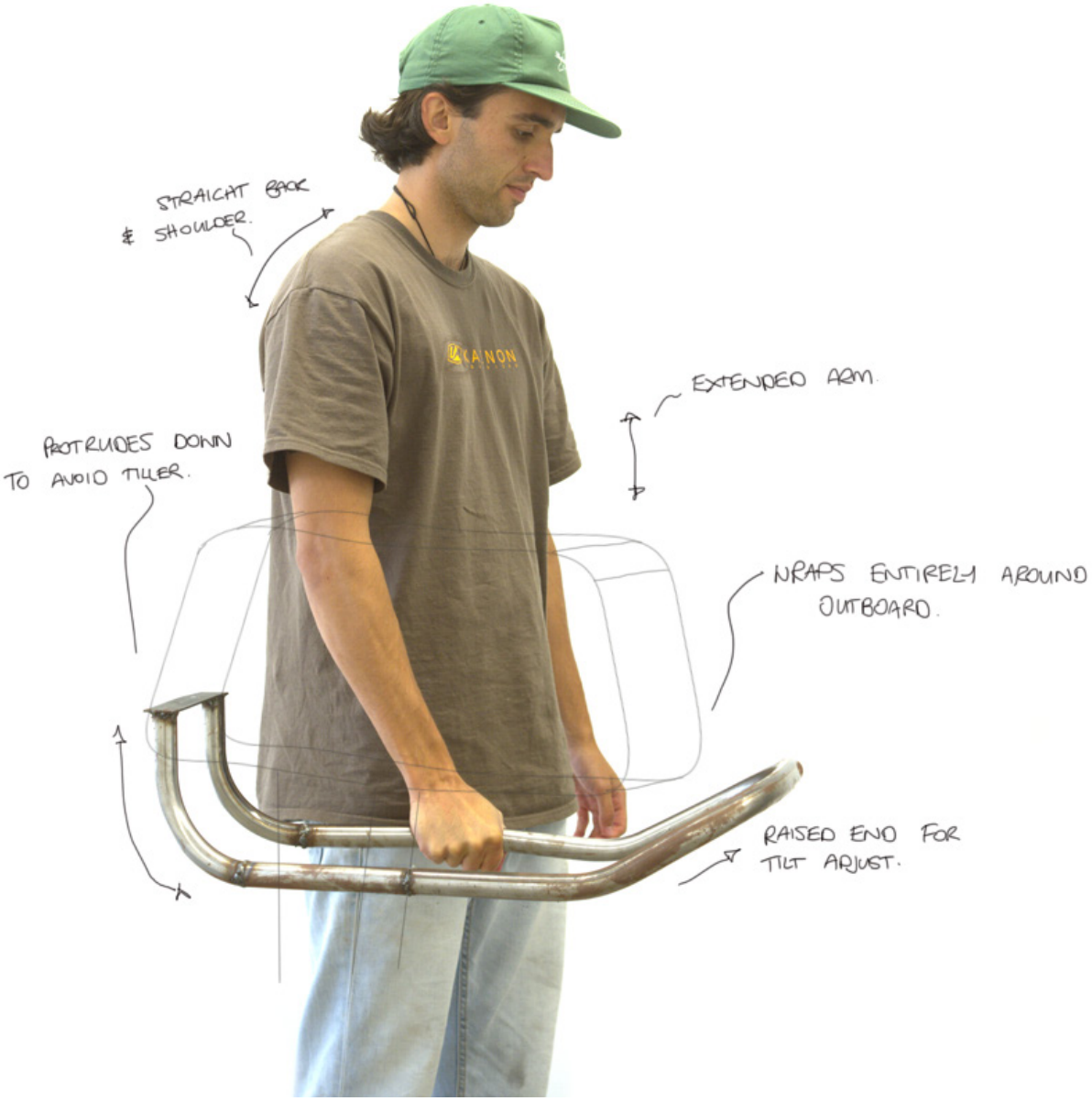


Figure 40 . Jenkinson (2021). Annotations of Prototypes Image 5

Figure 41 . Jenkinson (2021). Masters Cohort Informal Test Image 1

I informally tested prototypes with my masters cohort/ peers (consisting of 3 men and 3 women). They provided snippets of feedback for all of my prototypes from a design and HCD point of view.

Figure 42 . Jenkinson (2021). Masters Cohort Informal Test Image 2

Figure 43 . Jenkinson (2021). Masters Cohort Informal Test Image 3

Prototyping Reflection

As I prototyped ideas derived from sketches produced earlier in the project, I realised that lower register designs (designs that form around the base of the outboard compared to the top) were more ergonomic, especially when used to lift the piece. The higher register designs increased the lift's awkwardness and were physically challenging to lift onto a platform. My peers and I practised the action of carrying and lifting onto a raised platform as it was similar to lifting an IRB outboard onto a transom. This was observed as the most awkward aspect of IRB motor duties during the interviews and observational workshop.
The choice of materials worked fine as functional prototypes, although I was aware that the material choice would need to change in the harsh environment IRBs operate in. The material itself was malleable, and the ergonomic form of the prototype would not last after ongoing use. I needed to research materials that were applicable for the purpose of the design.

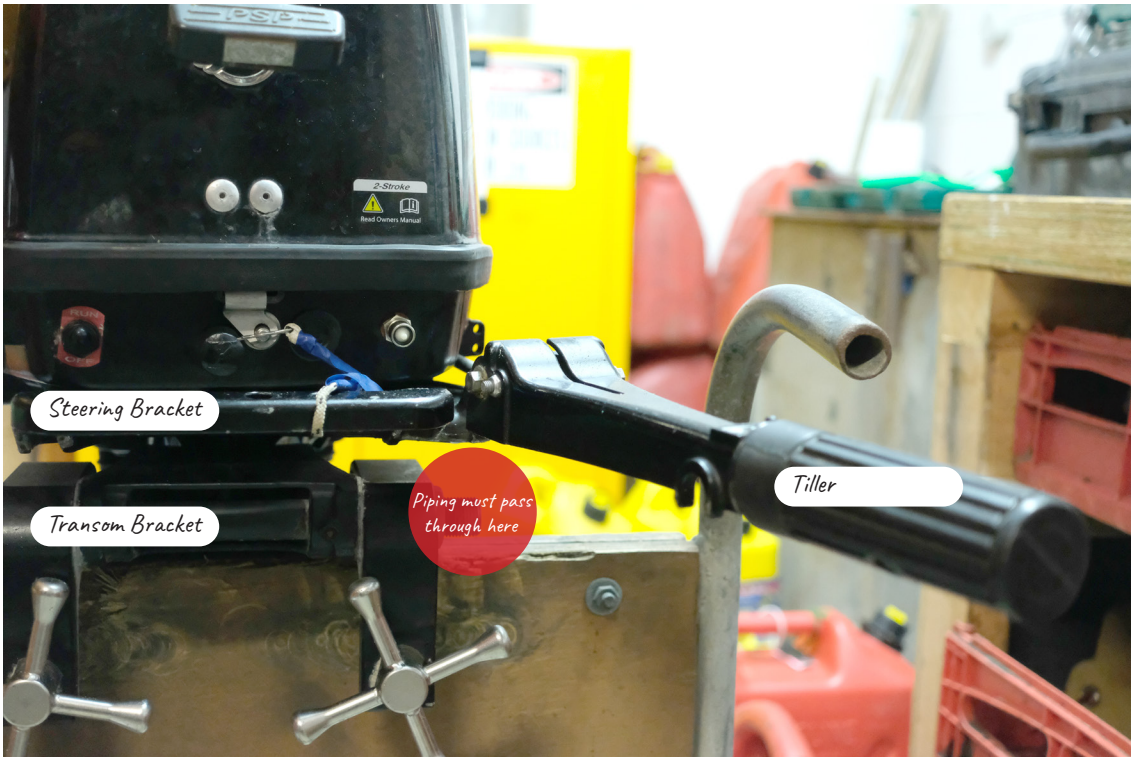


Figure 44 . Jenkinson (2021). IRB Outboad Parts

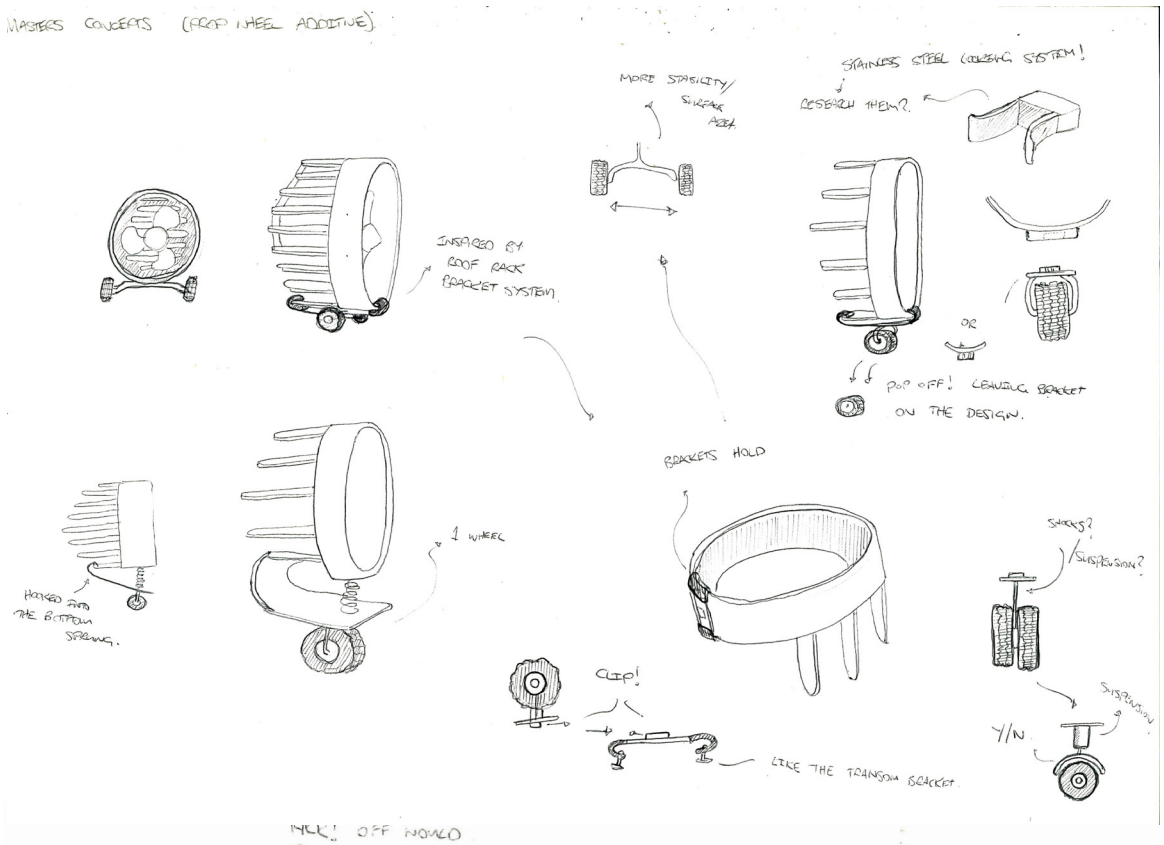
Designing around the Tiller

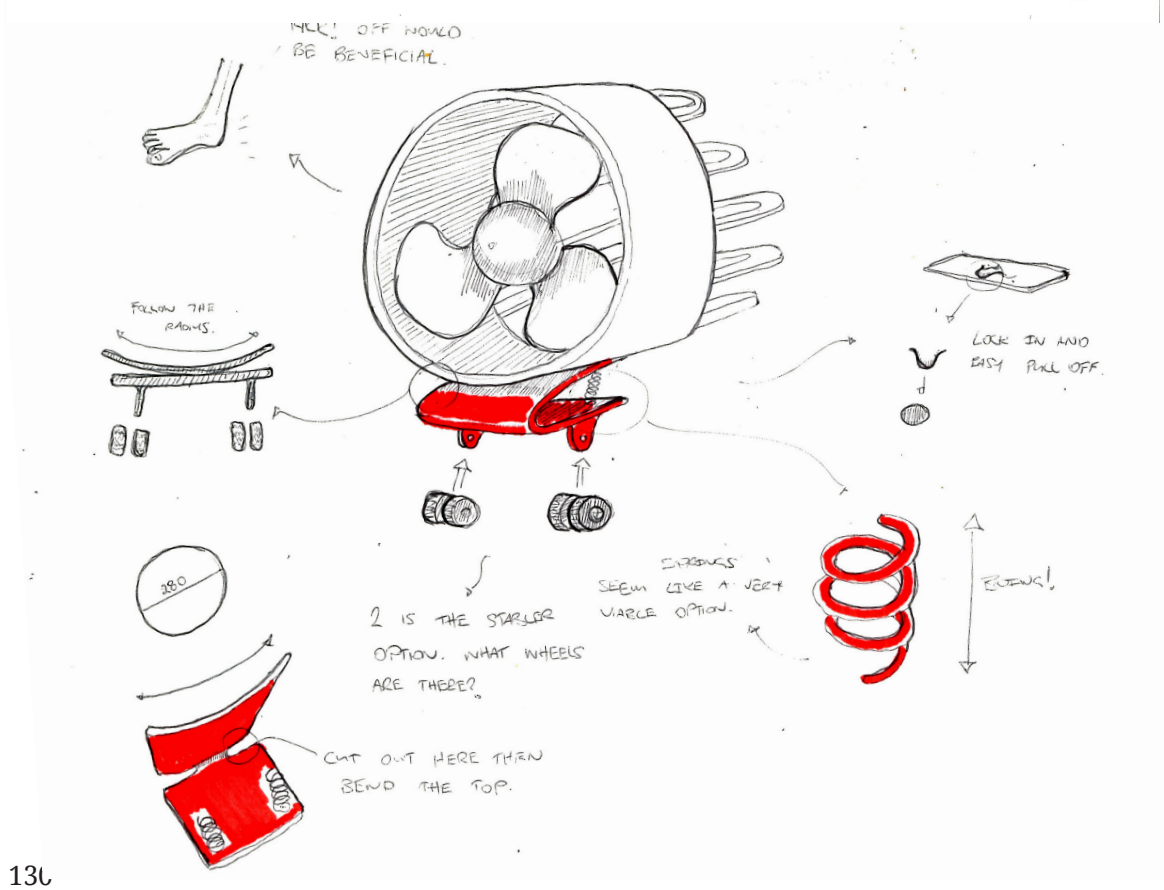
The tiller is a component of an IRB that controls the steering and acceleration of the boat. Unfortunately, the tiller is placed/ sticks out at the outboard base and is pulled upon its axis when transporting it. This tiller is why my previous sketches and designs travelled towards the top of the outboard, giving the IRB operator uninterrupted access to this component. In reflection with my master's cohort peers, we unpacked that a lower register design would potentially result in a more ergonomic lift. I considered forming the design to travel under the tiller and around the base of the outboard itself. I decided to reach out to a biomechanics specialist (interview further in the research) to back this assumption.

No More Wheels

In previous concepts and prototypes, I played with the idea of this design being made up of 2 pieces. Along with the carry additive, the idea of prop wheels was a concept I was interested in pursuing. The design was simple, a set of wheels allows the carrier/s to place the outboard on the ground (standing upright) and wheel it to its desired location. This design became unfeasible when sourcing a prop guard to design from an IRB Instructor. They said the prop guard's design was unsuitable to hold wheels and would not withstand the amount of weight when the design is placed upright. We discussed that introducing wheels would increase traction through water (if it were a permanent design) and that lifeguards may regard the action of 'dropping' the outboard onto those wheels/ prop guard as probable. The IRB instructor warned of this as a potential problem. The prop guard is considered a temperamental component that often bends to an irreparable/ unusable state. Bends/ damage to the prop guard usually occur during the action of 'beaching' the IRB. The IRB prop guard I sourced from this participant (to design with) was also bent and well used. I was suggested to steer away from this design by the IRB instructor.

A solution to this problem was to attach wheels to another part of the IRB outboard. I did not see this as a practical solution as the design would replicate the already existing outboard trolley (an unused piece of equipment stored in most corners of IRB gear sheds). I decided to forget about this direction and proceed to design for the IRB outboard's ergonomic carry. This design solution had the most potential of being readily accepted, used and satisfactory to its users. If the 'carry design' was functionally acceptable, IRB operators will not require wheelbase transport.


MASTERS CONCEPTS (DROP WHEEL ADDITIVE)
MORE STABILITY/ SURFACE AREA
STAINLESS STEEL LOCKING SYSTEM!
RESEARCH THEM?
INSPIRED BY ROOF RACK BRACKET SYSTEM.
OR
POP OFF! LEADING BRACKET ON THE DESIGN.
BRACKETS HOLD
1 WHEEL
HOOKED INTO THE BOTTOM SPRING.
SHOCKS? / SUSPENSION?
CLIP!
LIKE THE TRANSOM BRACKET
SUSPENSION
Y/N


NECK! OFF NOMAD BE BENEFICIAL.
FOLLOW THE RADIUS.
LOCK IN AND EASY PULL OFF.
280
2 IS THE STABLER OPTION. WHAT WHEELS ARE THERE?
SPRINGS SEEM LIKE A VERY VIABLE OPTION.
RISING!
CUT OUT HERE THEN BEND THE TOP.

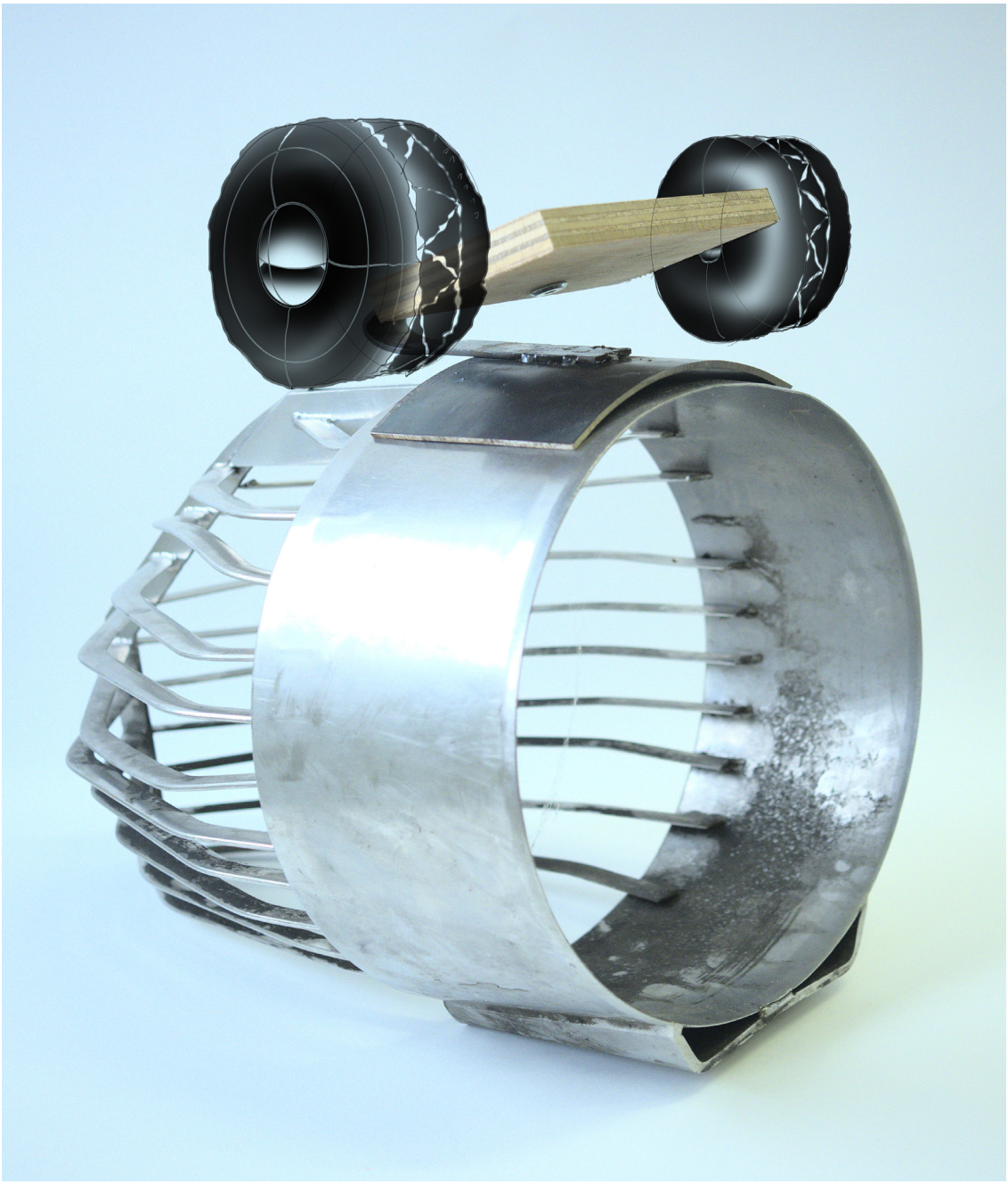


Figure 45. Jenkinson (2021). Wheel Base Idea Render

EXPERT INTERVIEW - Biomechanics Specialist

I conducted a semi-structured expert interview with a Biomechanics expert to gain insight into which aspects of the developing design/s were ergonomically appropriate and better understand what factors might influence the design. Using the photographs/ data collected from the observational workshop, we focused on the body positions of IRB operating women carrying and using the IRB motor. The interview assured me that I was improving the ergonomic experience of using/ transporting the outboard. The interviewee helped me consider how to better develop the design's physical experience by providing advice in designing for a comfortable, ergonomic lift.
Below are quotes I found most relevant and what I will implement as design constraints in this research:

The Lift Movement/ Posture:

The interviewee expressed the importance of a straight back during a heavy lift.

"Height is a big factor in this lift. Females are typically shorter than males, and so, will struggle to lift the outboard. This because they will be having to lift their shoulders more, putting more strain on their upper backs.

"If you're carrying anything that heavy, you want your shoulders to be in a fairly relaxed position, so it doesn't alter your posture causing the lifter to hunch over and increase load/ tension across your traps".

"The most efficient way to carry something is to hold it down by your pelvis, so your arms are pretty much extended and that allows you to use strength from your upper arms so you're not just relying on your forearms and having to hoist it up high".

"For lifting the motor onto the transom, can that be more of a tilt? This would create less of a lifting action and potentially make for an easier lift".

"When they are transporting the outboard a fair distance, you want to make sure allows their posture to be straight. A hunched over journey between IRB to wherever else would be detrimental to lower backs".

The Interaction Points:

The interviewee questioned how design could ergonomically accommodate hand positioning, hand size and grip strength/ comfort.

"The existing handles (steering bracket and base of cowling) are obviously not designed to be held or lifted with. Men typically have a larger hand size than women, and normally a higher grip strength than women. I can see (observing the picture) that the grip here is strenuous, especially for someone with a smaller body and hand size. A contact point that is not sharp or edged will help make the lift comfortable".

"Distribute the load as much as possible, at the moment, all the load is in the fingers".

"Something softer to contact will help with grip comfort".

Reflection

This interview motivated me to develop my design further. I was suggested to design the handle to sit lower. There was an opportunity to ergonomically better the concept/s I was producing. A lower register design could ergonomically accommodate more of the shorter population of IRB operators interacting with the equipment.

I believed that I was headed in the right direction for the contact points/ grips of the design. The expert and peers considered the 25.4mm radius tubing comfortable for a range of different hand sizes. 25.4mm diameter bar widths are a common measurement used in most cycling handlebars for both men and women (Handlebar Diameters, 2008). My peers and I saw fit to use this diameter for the design/s produced also. The next stage ensured that the design suggests the most ergonomic area for IRB operators to grip.

CO-REFLECTIVE WORKSHOP - Communicating CAD

It had been disputed whether the design should wrap entirely around the outboard (as one flowing form) or as two pieces (2 pieces that finish the stern side of the outboard). During this collaborative feedback session, I intended to understand the benefits of both, understand which SLS women would prefer and why. The intention of this was derived from insights I had found during my first workshop, where I observed action/ moments that I believe could benefit a handle that wrapped entirely around the body. These moments mainly included duties that involved tilting the IRB outboard on its axis and its protection.

I used a CAD render to communicate what the design may look like and how it would work. The render successfully put the plan in a visually realistic setting, and the participants were able to understand the design and its function.

Collaboratively reflecting on these different concepts with the IRB racing women, they considered the design direction a success. I assumed that the halo design (wraps around the outboard's circumference) would be too surrounding and 'in the way' of the outboards function. The halo design was positively commended and thought to be more like the original design, abiding by those who still want to carry it using the original method.

"This will help with moving the IRB motor definitely; imagine only having to carry an outboard with one hand?" - 21 year old IRB racer, 1 years' experience

Analyzing these women's positive feedback, I decided to refine further, test, and pursue this concept.

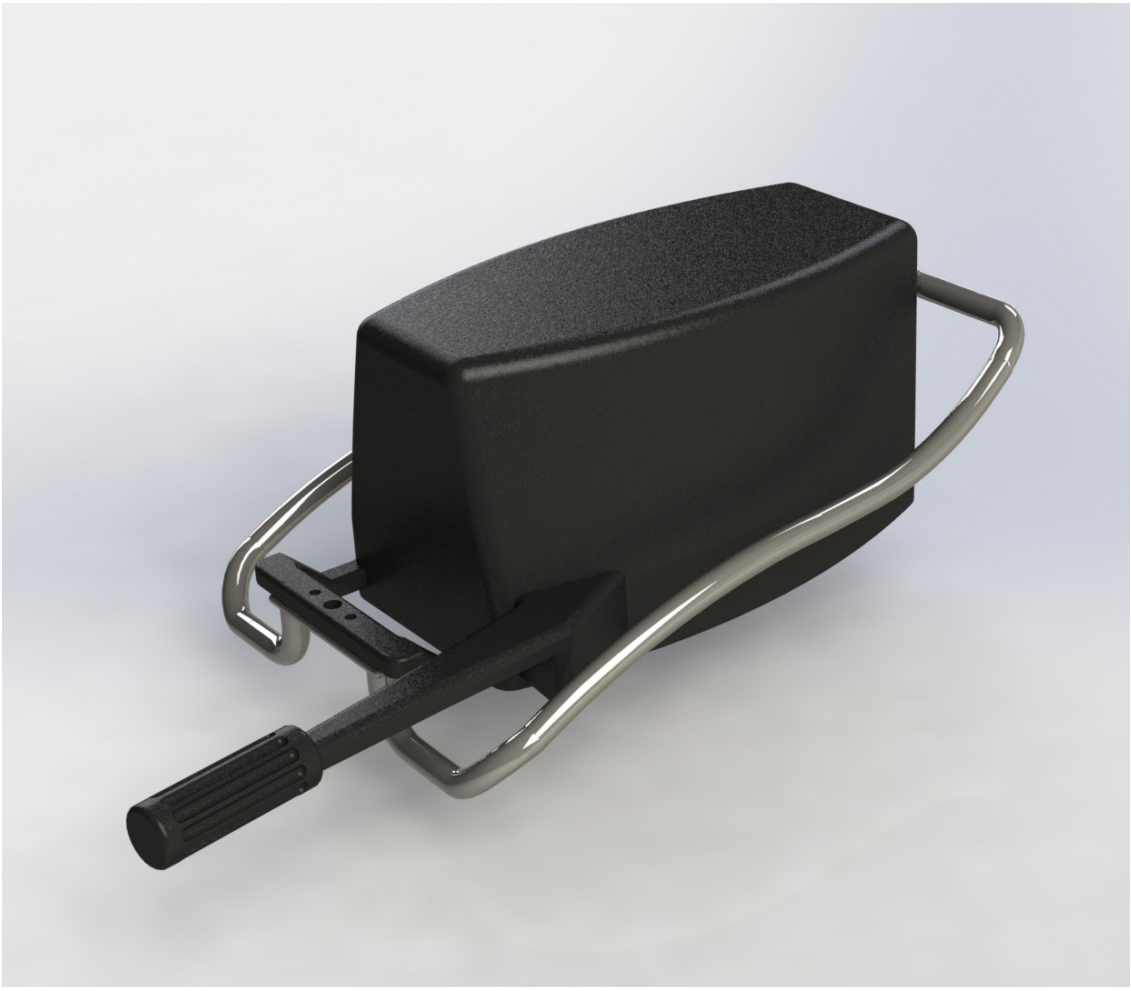


Figure 46 . Jenkinson (2021). Communicating CAD Workshop Render

PROTOTYPING - Development/ Material Testing

In my early concepts, I quickly realized that using 24.5mm x 1.6mm precision tubing as the primary material of the design would not be suitable As the metal bracket/ piping was subject to bending out of shape. The result was not ideal, especially (when weight was added to the design). To test developing design/s, I chose to bolt the concept on to the makeshift steering bracket. The 1.6mm thick piping concepts (although a functional failure) helped with understanding how I was to design and communicate how to use/ interact with the product. The 1.6mm (wall thickness) concepts allowed me to test each concept's feasibility through an HCD lens.

In summary, the first concepts were produced to test the designs feasibility, functionality, and suggestibility of use. After each concept was made, I often asked myself:

"If I were to look at this design objectively/ with no prior experience, what does it tell me? Where would I interact/ grip the design, and How would I use it?"

Asking myself these questions kept my design ideas cohesive and 'on the right trajectory'. Designing and observing through this lens allowed me to understand what ideas successfully communicated the design/s function. Analyzing these developments resulted in an understanding that the designs with simpler forms were most successful in communicating how to use the product correctly.

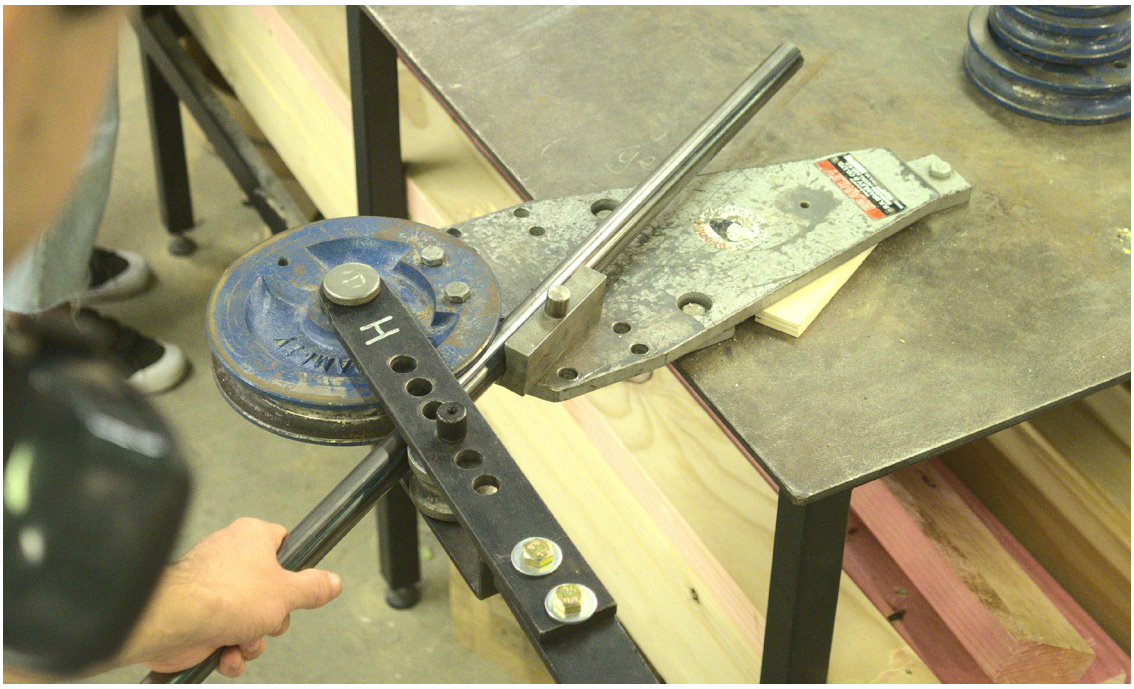


Figure 47 . Jenkinson (2021). Pipe Bender

PROTOTYPING - Development/ Material Testing

I noticed that some of the designs warped out of shape under load. To resolve this, I decided to look for a pipe with thicker walls yet was still of the same radius (25.4mm). After testing the radius with my master's cohort (3 women and three men), w¬e considered it a comfortable lifting radius. I decided to start using a 2.5 mm pipe wall thickness in my design/s. This wall thickness was able to handle the pressure of the weight and kept its form under load (although much harder to bend).

The workshop facilities only had one mandrel size I was able to bend my piping to. As said by the technician, the bend radius was "Roughly, a 90-95mm radius". I wanted to understand how tight I (or a fabricator) could bend the piping without deterioration or warping. I thought that the smaller the bend/s made could result in more surface area to contact and grip the design. This information was found further in the research through an informal conversation with a fabricator specialist.

The Application Method

I came into this phase assuming that tension joints will be adequate for joining the concepts to the steering bracket. As I informally tested the designs with friends from my master's cohort, I quickly realized that the tension method would not be suitable nor functional. The design was prone to twisting and could not function properly to the weight of the outboard. To resolve this issue, I started bolting the designs to the steering bracket itself. This was done by heating and flattening the pipe, then bolting it to the steering bracket. The flat side of the pipe provided a surface area to drill and bolt with. The 'bolting on' method was sufficient in exploring which designs would be most functional, ergonomic, and feasible. I was not pleased with the aesthetic of a flattened area in the pipe, nor did I see it being a viable method of attaching the concept onto the existing IRB steering bracket.

I found that the existing steering bracket design has three holes along its handle surface. I saw an opportunity to take advantage and use these holes for securing the concept onto the outboard. Ideally, I would like this design to be easily taken on and off by its user/s. Due to the product's functional nature, a manually tightened design to the steering bracket would not be secure enough. A loosely attached design affects the functionality of the product and the potential safety of those using it. When noticing that certain aspects of IRB operation (i.e., tilt adjustment) requires tools, I felt assured that using a tool (bolting) to secure the design would be an acceptable method.

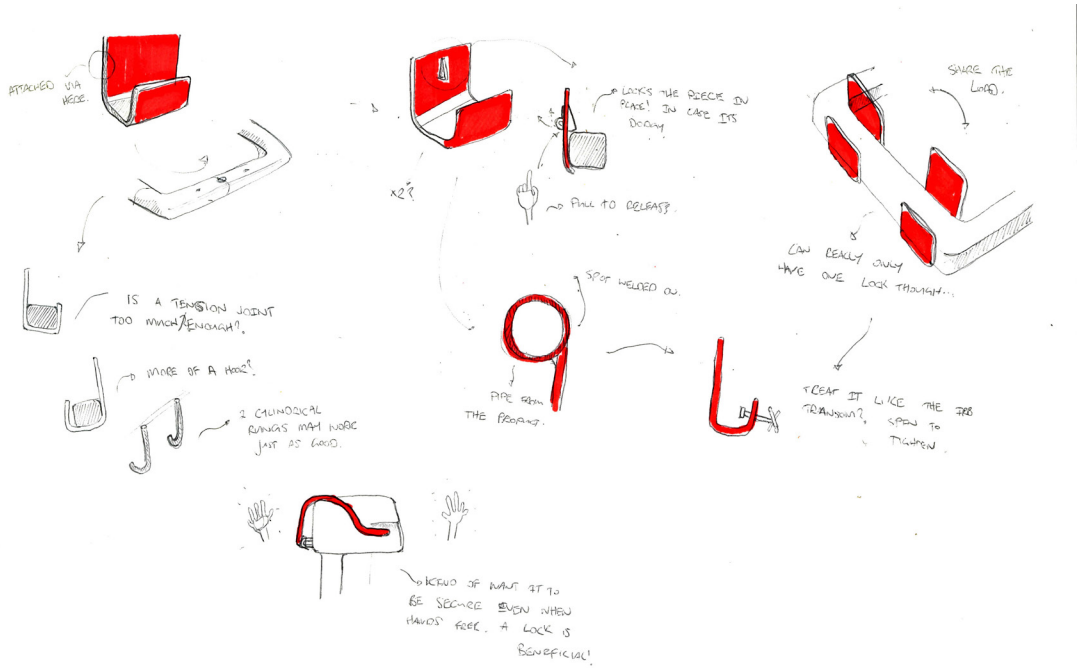


Figure 48 . Jenkinson (2021). Attachment Point

CO-REFLECTIVE WORKSHOP

This workshop was conducted to test developed prototypes/ design ideas with the Mercury 30hp outboard. This exercise aimed to understand if the design/s I had made fit well with the existing IRB equipment and not interrupt the flow of IRB operation duties. 2 women aged 22 in my masters' cohort joined me in this exercise. Together, we observed the concept being placed on/ around the outboard. We instantly realized that the design was too small/ narrow for the outboard form. I considered this an easy fix. What did concern me was how close the transom bracket and tiller were together. I did not consider how close they were together. It resulted in the design not fitting to the outboard. The pipe/ carry handle protruded too low from the steering bracket, hitting the transom bracket, deeming the design unusable. I had to consider a different way to connect the handle to the steering bracket. The design had to wrap between the transom bracket and tiller. After this point, I was free to design the way I saw fit. The (informal) feedback I obtained from my participant was obvious design critique/s of how to fit the design to the outboard better. They were impressed with the design's aesthetic cohesion to the IRB outboard.

> *"It just seems part of the outboard" - 21-year-old IRB racer, 1 years experience.*

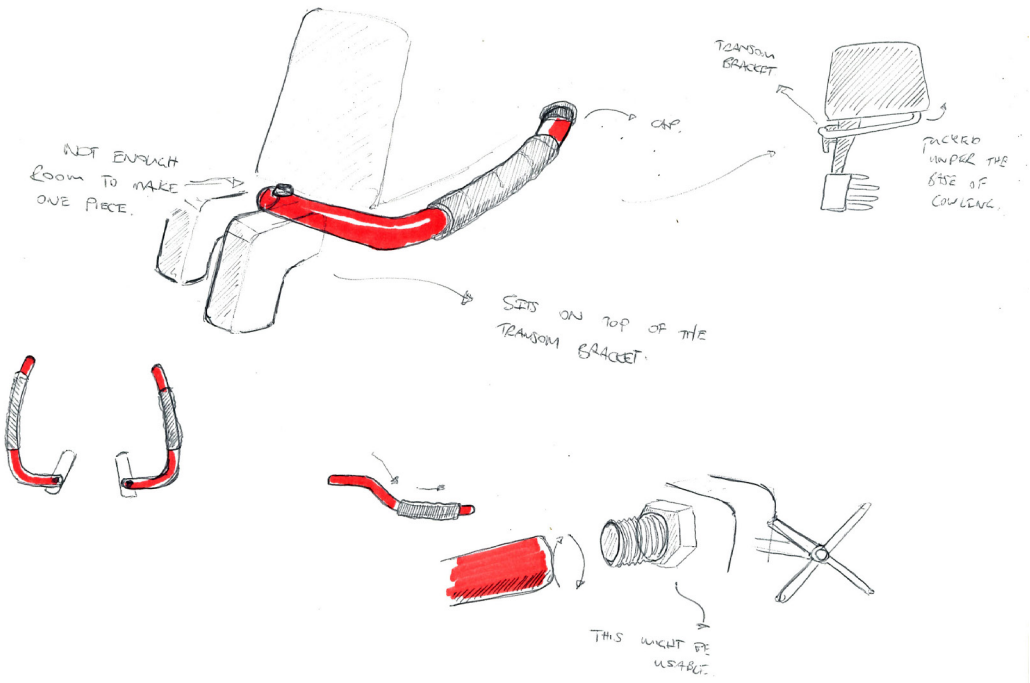
Although commending on the ergonomics of the handle, the participant suggested finding a way to improve its comfort (rather than grabbing piping, something more comfortable for the users' hands). Smooth surfaces were considered subject to slipping in wet conditions. My goal was to improve the design idea developed and continue to ideate improvements to the design/s function and manufacture.

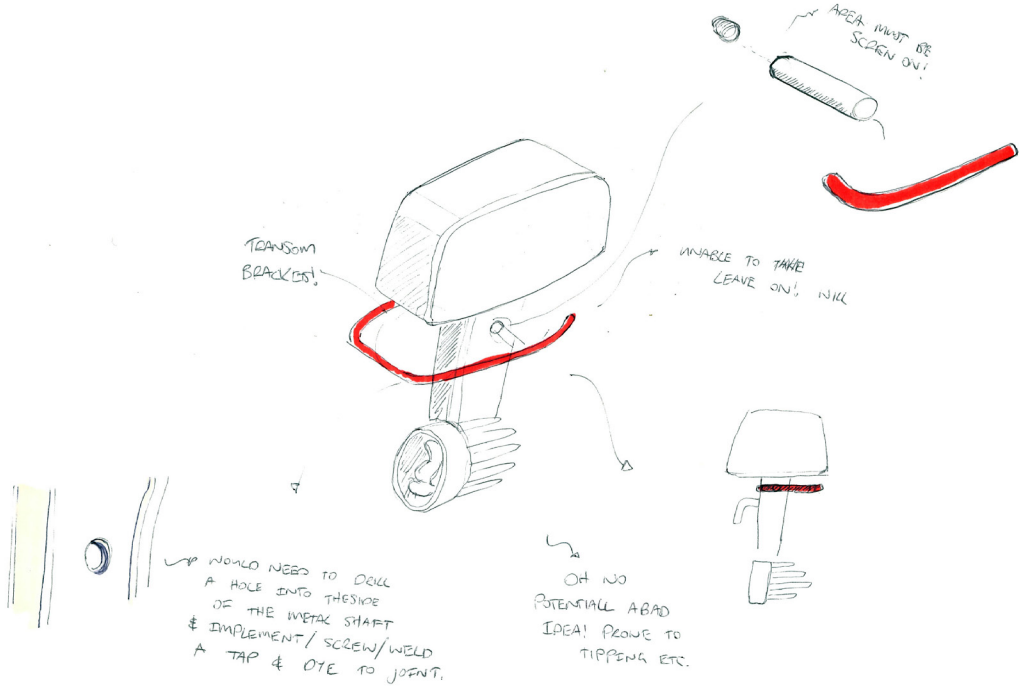
Figure 49. Jenkinson (2021). Co-Reflective Workshop Prototype on Outboard

Nearly a Change of Plan

During this exercise, I noticed two threads where the transom brackets fit onto the outboard. When asked about them, I was answered that these are “not used for anything in particular and normally have small caps on them to keep people from cutting their fingers”. At this time, I was worried about the structure of this design. I questioned its ability to stay on and function well (bolted to the steering bracket). I decided to consider another method of carrying the motor, using an area that is not already used as a carry handle. I saw an opportunity to design the attachment to the transom brackets and threads. The designs sat out of the way of the tiller, and I was able to bypass designing between the tiller and transom bracket (an aspect of the existing designed outboard that constrained what I was able to produce with the concepts). The design already sat approximately 200mm lower than the steering bracket and other designs I was producing. The new design direction I conceptualised would not allow the piping to bend right around the outboard (one pipe). This was because it would stop the outboard from tilting (an essential function of the outboard motor). The design had to be made up of 2 pieces.

After talking with my participants and conducting informal conversations with engineering lecturers/ technicians at AUT about this concept, we decided to pursue the steering bracket design. Reasons for this decision are included below.


NOT ENOUGH ROOM TO MAKE ONE PIECE.
CAP.
SITS ON TOP OF THE TRANSOM BRACKET.
TRANSOM BRACKET
PACKED UNDER THE BASE OF COUCH.
THIS MIGHT BE USABLE.


AREA MUST BE SCREW ON.
TRANSOM BRACKET.
UNABLE TO TAKE/LEAVE ON, NILL
WOULD NEED TO DRILL A HOLE INTO THE SIDE OF THE METAL SHAFT & IMPLEMENT/SCREW/WELD A TAP & DYE TO JOINT.
OH NO POTENTIALL A BAD IDEA! PRONE TO TIPPING ETC.

Design Feasibility (informal discussion with Engineer and Technicians)

I reached out to the technicians and an engineer for some advice. Comparing the steering bracket and transom bracket designs, we considered the steering bracket design more beneficial to the user (after concluding with an engineering lecturer that the steering bracket can carry the outboard load conditionally). We deduced that the steering bracket design (the concept that wrapped around the whole body) would benefit the target user and situation more because:

Protection of the outboard itself.
Opportunity to help tilt the outboard onto its axis.
Protection of the user/s hands.
Potentially a more ergonomic outcome compared to the transom bracket design (more surface area to grab).

The condition of pursuing this design direction was the addition of secondary brackets. I needed a second mounting point on the rear of the outboard to ensure the designs functional feasibility. The base of the outboard (where the cowling is attached) is made from aluminium. Attaching a bracket to this area is possible and was suggested.

The engineering lecturer suggested changing the material of choice from Electric Resistance Welded (ERW) tubing/ Precision tubing to 316 Marine Grade Steel Pipe. Seamless 316 stainless steel tubing has high strength and excellent corrosion resistance, including marine or highly corrosive environments (Seamless 316 Stainless Steel Tubing, n.d.). The lecturer enthused that this piping would not need a rubberised paint additive/ rust corrosive protection, a component I have intended to add to the final.

Figure 50 . Jenkinson (2021). Bracket CAD

BRACKET DESIGN

Using a real outboard for dimensions, I rapid-prototyped a secondary mount for the carry handle. The implementation of this design was a condition to following the design that wraps around the outboard completely. I saw an opportunity to use the existing grip area (base of cowling) to share the outboard load. With the intention of not manipulating the current outboard in any way, the design fits under the cowling base without the need for tooling (bolting). Rubber is added to the contact points (where the bracket contacts the outboard) to ensure this outboard area and the bracket itself do not blemish.

Figure 51 . Jenkinson (2021). Bracket 3D Print

COLLABORATIVE FEEEDBACK - Feedback from SLS Women

This workshop intended to validate the satisfaction of my refined design with the participants. I wanted to ensure the new bracket additions were not going to be an annoyance or get in the way of any IRB operating duties. The feedback I received was positive. They like the design direction and deem it feasible and potentially effective. When observing the design, they were wary if the brackets would stand the load of the outboard.

"I reckon this will work great, just make sure the brackets will hold up to the load put on them" - 21-year-old IRB racer, 1 years experience.

Luckily, I was ensured the probability of this design addition and its effectiveness from the engineer in a previous interview. The participants commented on having a soft are/ padding to grip with, referencing other surf crafts they use recreationally and in competitive surf lifesaving. Most of these touchpoints had a neoprene padded, polywebbing handle. Implementing this sort of handle would not improve the functionality of this design. I set out to find better solutions to a more comfortable touchpoint for the refined design.

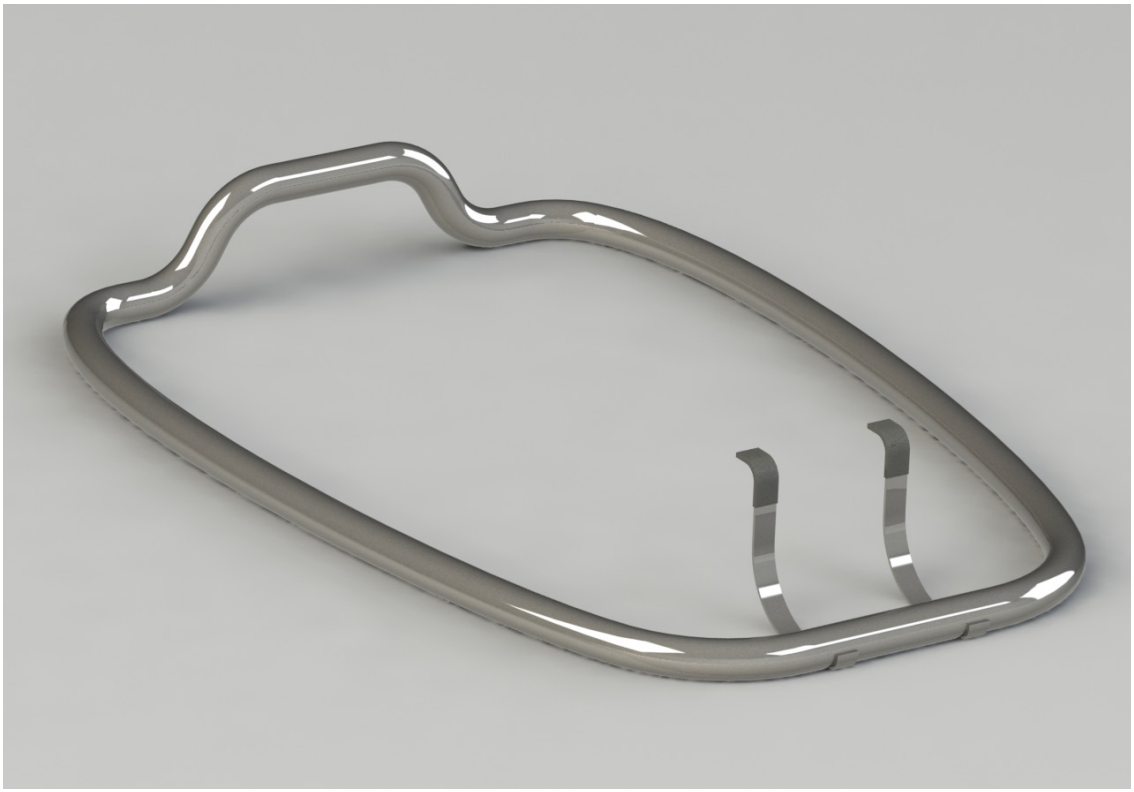


Figure 52 . Jenkinson (2021). Final CAD Render

FINAL REFINEMENT/S OF SOLUTION

I want this carry handle to be suggestive of how it is appropriately used. Using HCD signifiers, I intend to use EVA foam to communicate where to grip the design. As well as being an HCD signifier, the foam will act as a comfortable touchpoint for its user/s. A comfortable grip was suggested by the Biomechanics Specialist and the participant involved in the research. The EVA foam is attached via an adhesive and wraps entirely around the piping. The foam is placed in the most ergonomic areas, suggesting the most comfortable lifting the outboard to the user. I got the idea of using EVA foam from fishing rods, where it has been implemented at its touchpoints (handle areas) to comfort fishermen's hands ergonomically.

Figure 53. Bulmer, A. (2014) ROD HANDLES – CORK OR EVA FOAM https://activeanglingnz.com/2014/05/01/rod-handles-cork-or-eva-foam/

Discussion

INTRODUCTION

As a former lifeguard, this research area initially focused on SLSNZ, a culture, organisation and sporting lifestyle that I considered myself to have a good understanding of. I held assumptions and hunches towards many different aspects of SLS. Assumptions such as non-ergonomic, existing equipment the prevalence of a gender equity issue were included in this bias. As discussed in the introduction, I recognised an opportunity to explore why there appeared to be an absence of women participating in IRB operating duties and gaining IRB qualifications. Anecdotally (from observations and discussions with colleagues and being involved in previous SLS projects), it seems from the outset that there was an opportunity for implemented design methods to better understand what challenges women may face concerning their participation in this SLS activity. I saw designed intervention/s as a method to identify opportunities that help SLS women to participate across the full spectrum of SLS life-saving activities. Using co-design inspired and HCD methods, I sought to find out why SLS women were hesitant to engage in IRB operation, a male-dominated activity/ qualification in SLSNZ. Through this qualitative approach with women who operate IRBs, I was able to gain a detailed understanding of their experiences as IRB operators. Their insights and stories helped guide this journey into a satisfactory and appropriate design supporting women as the primary user group. The subsequent outcome of this research process was ultimately an ergonomic product designed to more effectively accommodate SLS women in the most physically challenging areas of IRB operation (further discussed below). I hope this research helps set a precedent for using HCD appropriately and co-design approaches in SLS and/or sporting organisations where gender inequity/ gender dominance issues may be present.

RESEARCH CONTRIBUTIONS - Ergonomic Barriers to Participation

I identified that existing IRB equipment was not designed to consider the physical capabilities of all its potential users. Through observations and roleplay as an IRB operator, I discovered that the areas around IRB operation that do not consider women's physical capabilities are the equipment surrounding maintenance and the motor. These aspects negatively impacted the perception of the activity/ qualification. In order to gain an IRB qualification, recruits must be able to perform all duties consisting within IRB operation (IRB maintenance tasks being a majority of these duties). The qualification allows this community to use and perform surf rescues in IRBs. This qualification enables lifeguards to progress further as a lifeguard in SLSNZ, being able to apply for patrol captains and higher roles within their chosen Surf Clubs. The barriers to SLS women's participation in IRB operation were physical. The physical barriers have were found to be exaggerated by men who operate IRBs, the extent being that they would take it on themselves to perform these physically challenging tasks, not providing women members with the opportunity to perform tasks themselves. This behaviour results in a male-dominant culture and a lack of role models for SLS women interested in IRBs. A significant aspect I found shocking is the impact that a small, physically challenging task within IRB operation has on women who operate IRBs. Through observations and insights discovered, I can express that SLS women are very able to perform a vast majority of IRB operating duties. Some tasks (and the behaviour of the operators around these tasks), such as those around the motor, negatively affect SLS womens participation and perception of IRB operation.

Women who operate IRBs described feeling incapable of lifting the motor and successfully completing similar IRB operating tasks. These tasks include engine maintenance, surf navigation and most heavy lifting aspects. ARANCIA and SLSNZ did not design the specific pieces of equipment that women who operate IRBs found physically challenging. The motor is designed by Mercury Marine and is adapted to fit IRBs and their function. SLSNZ successfully accommodates women in most SLS activities (providing women with fitting helmets, lifejackets etc.) by purchasing ergonomic products available to them. This research revealed how more ergonomic designed interventions are needed to benefit both men and women who operate IRBs.

Figure 54 . Jenkinson (2021). Final Concept Image 1

RESEARCH CONTRIBUTIONS - Unpacking a Male-Dominant Culture

One of the most impactful research findings was unpacking the male dominance/ gender equity challenge that appears to have been prevalent in SLSNZ. Discovering the historical extent of this issue (Simatos, 2016) challenged my personal view of the organisation and its acceptance of women as SLS members. I admire the improvements toward gender equity in SLSNZ culture at present (2021) (Harvey, 2010). I also assumed there were still traits of this discriminatory behaviour in specific SLSNZ activities, including IRB operation, due to women's lower levels of participation. Unpacking why SLS women were hesitant to participate in IRB operation, I found that the functionality and ergonomics of equipment likely played a large part in their lack of participation in IRB operation. Directing my focus on the ergonomics of the outboard allowed me to accommodate women's physical capabilities better. It is hoped that this may result in a change of behaviour of both SLS women and men as women gain competence and confidence in achieving any/ all IRB operating and SLS tasks/activities. As more women become capable of performing these tasks, they become role models, influencing the broader population of SLS women to participate in the same or similar activities. As recognised in a user interview, "You cannot be what you do not see". Consequently, increasing the access for women towards IRB operation benefits the wider community. Furthermore, the implementation of ergonomic design has the potential to spark a behaviour change in men. Recognising that women are equally able to participate and undertake the same tasks should result in a more equal relationship between SLS men and women. It is hoped that the ergonomic improvements will provoke a behaviour change where men who operate IRBs don't feel they need to 'take over' when it comes to specific IRB operating tasks. Seeing women easily accomplish the previously challenging tasks with ease will help men become more trusting and accepting of SLS women in all IRB operating and SLS duties.

Figure 55 . Jenkinson (2021). Final Concept Image 2

Coming from an SLS background, my perception of SLS (especially IRB operation) and its culture has changed since the start of this journey. I intended to provide women who operate IRBs with a voice and an opportunity to help solve an issue they are experienced in. I propose that the result of the intervention designed will provide women who operate IRBs a feeling of confidence and competence in the SLS activity. Their participation in this research changed me as a working industrial design researcher and former lifeguard. Using a co-design inspuired approach, I learnt that women are more capable of performing and completing IRB operating duties than I previously assumed. Preconceived perceptions of unconsidered equipment and the sports dominant male culture are significant barriers to this communities participation. Ergonomically designed product/s may help solve this issue and provide the confidence that women who operate IRBs may not have. But still, those who are impacted by this product (and I) must recognise that this project is a small step in a bigger journey that SLS may need to embark on to improve gender equity in SLS. The final designed intervention may highlight/ provide a foundation to an area of SLSNZ in need of (design) attention.

THE PROCESS

Using HCD as the theoretical foundation and approach of this research, I identified that the physical tasks around IRB maintenance and heavy lifting were the main aspects where women felt least capable and physically challenging. They were also the areas where they had less previous experience. The involvement of the participants in this research was vital to ensure an appropriate design outcome. While it became clear that using codesign methods were improbable (due to participants time constraints), I still believed the collaboration with these women should be prioritised in this study. Co-reflective workshops were an attempt at an effective merging of codesign characteristics and HCD methods. This considered approach helped the participants feel more like partners rather than subjects in this study. The workshops provided them with a voice and an opportunity to reflect on the developing ideas and concepts. Characteristics of Codesign such as an equal partnership between researcher and participant were essential to follow in this research. The collaborative nature of this approach helped women who operate IRBs, and I form a professional and positive work relationship. This was important as previous research had revealed that women who operate IRBs had struggled with male dominance and gender inequity in the past. The design process was produced to consider a potential, prevalent gender equity issue and explicitly allowed this community to determine my design direction. Applying action research principles collaboratively with women ensured the ongoing teamwork and satisfaction of the design outcome.

LIMTATIONS - Mixed Methodologies/ Recruitment

An IRB operating Qualification is offered to all lifeguards interested in the activity and over the age of 16. A limitation of my research was not allowing participants under 18 to participate in this study (due to the ethical scope). These guards seemed more available and eager than those who could participate in this research (discovered while recruiting participants via posters). Those who participated in this study were less available because of work, family and lifeguarding commitments. A large portion of the lifeguards/ women who operate IRBs interested were involved as paid guards. Volunteer guards are contracted to patrol neighbouring beaches over NZ summer and holidays during a paid guard occupation. An implication found in this research is that although a consistent co-design approach may have been more beneficial, it is not essential. Considered interactive workshops that focus on user feedback and insight is an efficient/ effective alternative. This adapted method of research is helpful for those with inconsistent participants.

I intended to involve participants consistently throughout this research, positioning them as partners in this study (Langley, Wolstenholme and Cooke, 2018). I initially anticipated using co-design methods to collaboratively design ideas and test developing designs (on water and land) with women who operate IRBs. Testing design ideas were considered potentially (physically) harmful by AUTEC, resulting in the denial of this intention. I changed my approach to be a more human-centred design approach on account of these added constraints. I still used co-design principles to help form a professional work relationship between the researcher (myself) and participants. The once anticipated co-design workshops became co-reflective (collaborative and reflective) workshops. Co-reflective workshops gave women who operate IRBs the opportunity to observe, reflect on and critique developing designs. I learnt that co-reflective workshops could positively impact a design project when the intersectionality of the researchers and participants can potentially cause social tension.

Figure 56 . Jenkinson (2021). Putting up Map

Previously in this study, I saw a benefit in recruiting/ interviewing women who operate IRBs from several Surf Lifesaving Clubs. The population of recruits would provide more feedback to the research and support that would get noticed by those higher up in SLSNZ. Unfortunately, only 1 of 4 clubs was willing to participate in this research. I assume this was due to the busyness of competitions and beach visitors in the Summer for these clubs.

Amidst my studies, two COVID-19 lockdowns had been placed for the Auckland region. The lockdown restrictions affected my access to university workshops and interfered with access and the ability to interview and run co-reflective workshops. My hunch was that the restrictions placed for Aucklanders also negatively affected the racing participants (most involved participants in the research) training sessions; and, therefore, co-designing with these women.

LIMTATIONS - Sourcing an Outboard

Sourcing a 30HP motor was a surprisingly difficult process. I was unsuccessful in obtaining consistent access/ borrowing an SLS outboard. I assume this was because the projects prototyping phase was mainly over Summer (A time where the SLS community needs outboards). Consequently, I needed to make outboard mockups, which were relied on when designing and testing the functionality and feasibility of concepts. The absence of an outboard made it challenging to produce prototype/s to precise measurements, a complicated task when designing attachments (mounting brackets) between the handle and outboard. This made designing accurate components of the product a strenuous, time-consuming activity. In an ideal situation, a suitable outboard (and potentially an IRB) would have been available for the duration of the bracket development.

FUTURE RECOMMENDATIONS

This research has helped make visible the various aspects of IRB operation that are physically challenging. There is a lack of ergonomic consideration towards these products, resulting in the continuation of a male-dominant culture and women being hesitant to participate in the activity. This is despite other areas of SLS showing equal participation with respect to gender. An ergonomic carry solution for the IRB outboard is just one step towards more ergonomically considered equipment available to help level the playing field between men and women. Aspects of IRB maintenance such as engine function/ repair are further areas of IRB operation that require design attention to help provide women with greater confidence in all aspects of IRB operation.

There is also an opportunity for surf navigation to become a less fearful aspect of IRB operation. The fear of operating in large conditions affects all who are involved in IRBs. During the interviews, I discovered that this fear is overcome through consistent operating practice in large surf. Recruits new to IRB operation are an example of these particular operators. Through this research, I identified an opportunity to support those fearful in rough surf conditions mentally. I see an opportunity for designed intervention to resolve this issue in IRB operation.

In terms of the product I designed, I see an opportunity to make the design more disassemblable. A hunch I have for a product like this (derived from my tacit knowledge in SLS) is that it may not be as readily accepted by the broader IRB operating community as anticipated. Therefore, an easily assemblable and disassemblable design allows those hesitant to use the product to remove it efficiently. I see an opportunity to design a method of assembly that tightly fits the concept onto the outboard without using external tooling (bolts and nuts).

Future research should focus on ergonomic testing for safety and performance. For example, it would be beneficial to consult an engineer to test the carry handle strength and stability in digital simulations. Such simulations should mirror the stability of the outboard when being carried by users, as determining the strength of the handle and the attachment mechanism, to ensure that these may perform without compromising the motors integrity. The test should also be undertaken to explore whether the handle mechanism and outboard can withstand being knocked over because or hit in other ways. Further evaluation should consider both land and water-based tests, to ensure that the handle attachment performs as intended and is safe in all use situations.

Figure 57 . Jenkinson (2021). Prototype Test with Outboard

More importantly, I see the benefit of further testing and developing this concept for manufacturing. A better understanding of manufacturing limitations (especially for the designs mass manufacture) may affect the form/ material of the concept.

For future research, I recommend the use of codesign methods throughout the study. The design outcome can benefit from a more consistent collaboration between the researcher and participants. Unfortunately, I was unable to use a codesign/ PAR methodology as I had hoped. An AR methodology, co-reflective workshops, and a considered HCD approach was my solution to this inability to follow a 'true' codesign process described by Sanders (2008). I was able to collaboratively plan, observe and reflect with women who operate IRBs. This was deemed an effective solution. I assume a codesign approach will only benefit the researcher and participants work relationship and validity of a successful design direction by the target user. Had covid-19 not impacted my research in the way it had, I believe I would have gained as a designer by experiencing a codesign process.

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Appendices

INVITATION

To all surf lifesaving women,

My name is Adam Jenkinson, I am a masters design student from Auckland University of Technology (AUT) and I am undertaking research to better understand how the design of products may help Surf Lifesaving women participate in Inflatable Rescue Boat (IRB) operation.

I would be very happy to invite you along to a series of small co-design workshops (After Sunday IRB trainings) and interview where both participants and I will explore this problem using industrial design methods. If you're a SLS qualified female lifeguard, over 18 years and interested in participating in this research, please contact me for further information.

adamz.j@hotmail.com
0211312123

The information gathered during the workshop might be published or used later for research purposes. All information will be handled anonymously.

AUT UNIVERSITY
NEW ZEALAND

Approved by the Auckland University of Technology Ethics Committee on 6/10/20290

AUTEC Reference number 20/260

PARTICIPANT INFORMATION SHEET - Interviews

"Hello, my name is Adam Jenkinson. I am currently a master's student studying a Master of Design (Product Design at Auckland University of technology (AUT). I am interested in SLSNZ and ergonomic design."

As part of my post graduate study, I am undertaking research to better understand how the design of products may help Surf Lifesaving women participate in Inflatable Rescue Boat (IRB) operation.

WHOM DO I CONTACT FOR FURTHER INFORMATION ABOUT THIS RESEARCH?

Researcher Contact Details:
Adam Jenkinson
adamz.j@hotmail.com
+64 21 1312123

Project Supervisor Contact Details:
Stephen Reay
Stephen.reay@aut.ac.nz,
09 021 9999 ext 6719

HOW WILL MY PRIVACY BE PROTECTED?

You will not be anonymous to myself. This means I will know your name and what you say during the workshop.

For my research documentation, the names relating to any examples, photos, videos, or audio recordings will be changed with your permission so you cannot be identified. Everything that we collect will be kept for a minimum of six years and then destroyed.

WHAT DO I DO IF I HAVE CONCERNS ABOUT THIS RESEARCH?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor:

Stephen Reay, stephen.reay@aut.ac.nz,
09 021 9999 ext 6719.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC:

Dr Carina Meares
ethics@aut.ac.nz /
921 9999 ext6038

Participation Information Sheet

An Expert Interview about empowering/ engaging SLS women to participate in IRB operation through industrial design.

17/8/2020

Approved by the Auckland University of Technology Ethics Committee on 6/10/2020
AUTEC Reference number 20/260

Note: The Participant should retain a copy of this form.

WHAT WILL HAPPEN DURING THIS RESEARCH?

Interviews will be approximately 30 minutes long. You will be asked about your experience of using IRB's and related rescue equipment.

WHY AM I BEING INVITED TO THIS WORKSHOP?

You were chosen to participate in the study as you are an adult (over 18) who is qualified in or is training to be qualified in IRB operation.

WHAT IS THE PURPOSE OF THIS RESEARCH?

We are interested in understanding why only 28% of female lifeguards are IRB operators and how we can better support SLS women to participate in this SLS activity. We are interested in exploring whether IRB equipment can be better designed for use by women. The purpose of this research is to find out what aspects of IRB operation may benefit from better ergonomic design. With your help, the outcome of the research will include product prototypes that are ergonomically designed to cater for women who operate IRB equipment. The results of this research will also be published in a master's thesis, which you will have access to once finished.

WHAT ARE THE COSTS OF PARTICIPATING IN THIS RESEARCH?

There is no cost to you for participating in this research other than approximately 30 minutes of your time.

WHAT ARE THE BENEFITS?

I benefit from this research by using the results to complete my qualification. I also get to practice my research skills and gain experience running a project like this. In return, I hope that you will benefit from the opportunity to contribute towards the improvement of IRB equipment.

WHAT OPPORTUNITY DO I HAVE TO CONSIDER THIS INVITATION?

You have two weeks to consider this invitation, by contacting me via email using the details provided on page 1.

WHAT COMPENSATION IS AVAILABLE FOR INJURY OR NEGLIGENCE?

There is no compensation for this research, and you are undertaking the activity voluntarily.

WHAT ARE THE DISCOMFORTS AND RISKS?

We have no intention of making you feel discomfort at any point; however, you have every right to respond that you would prefer not to answer any of our questions. We don't expect there to be much discomfort or risk in this research. However, you may feel uncomfortable sharing your opinions, in which you have every right to respond that you would prefer not to answer any of the questions. You may alsofeel tired if the sessions are too long.

HOW WILL THESE DISCOMFORTS AND RISKS BE REDUCED?

The sessions have been designed to encourage casual conversation. However, you are free to not participate if you feel uncomfortable with any questions. You can also talk to myself, the researcher, at any time if you have questions or concerns about the interview. You can leave or withdraw from the interview at any time, no questions asked.

WHAT COMPENSATION IS AVAILABLE FOR INJURY OR NEGLIGENCE?

In the unlikely event of a physical injury as a result of your participation in this study, rehabilitation and compensation for injury by accident may be available from the Accident Compensation Corporation, providing the incident details satisfy the requirements of the law and the Corporation's regulations.

HOW DO I AGREE TO PARTICIPATE IN THIS RESEARCH?

You may agree to participate in this research by contacting me (Adam Jenkinson) via email using my contact details provided on page 1. Your participation in this research is voluntary (i.e. it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. You are able to withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible. Your decision to participate in the study will have no effect on your standing within the SLSNZ community or affiliated club. You will be given 2 weeks to reply/ consider participation in this research.

WILL I RECEIVE FEEDBACK ON THE RESULTS OF THIS RESEARCH?

Participants will be informed and receive a brief summary of research findings. If you would like to receive more information about the results of this research, you can let us know via the consent form and we will send the research documents to you once the study is completed.

WHAT ARE THE LIKELY OUTPUTS OF THIS RESEARCH?

The outputs from this research include a design concept/ prototype that improves some aspect of IRB operation by the surf lifesaving community. The findings will contribute towards a master's thesis.

PARTICIPANT INFORMATION SHEET - Co-Reflective Workshops

"Hello, my name is Adam Jenkinson. I am currently a master's student studying a Master of Design (Product Design at Auckland University of technology (AUT). I am interested in SLSNZ and ergonomic design."

As part of my post graduate study, I am undertaking research to better understand how the design of products may help Surf Lifesaving women participate in Inflatable Rescue Boat (IRB) operation.

HOW WILL MY PRIVACY BE PROTECTED?

Your identity will be known to other participants in the group and the researchers. It is expected that you and the other workshop participants will respect each other and maintain each other's privacy. For our research documentation the names relating to any examples, photos, videos, or audio recordings will be changed with your permission so you cannot be identified. Researchers will maintain the confidentiality of participants through their report writing and documentation. Everything that we collect will be kept for a minimum of six years and then destroyed.

WHOM DO I CONTACT FOR FURTHER INFORMATION ABOUT THIS RESEARCH?

Researcher Contact Details:
Adam Jenkinson
adamz.j@hotmail.com
+64 21 1312123

Project Supervisor Contact Details:
Stephen Reay
Stephen.reay@aut.ac.nz,
09 021 9999 ext 6719

WHAT DO I DO IF I HAVE CONCERNS ABOUT THIS RESEARCH?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor:

Stephen Reay, stephen.reay@aut.ac.nz,
09 021 9999 ext 6719.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC:
Dr Carina Meares ethics@aut.ac.nz / 921 9999 ext 6038

AUT
NEW ZEALAND

Participation Information Sheet

A series of co-design workshops with the vision of empowering/ engaging SLS women to participate in IRB operation through industrial design.

17/8/2020

Approved by the Auckland University of Technology Ethics Committee on 6/10/2020
AUTEC Reference number 20/260

Note: The Participant should retain a copy of this form.

WHAT WILL HAPPEN DURING THIS RESEARCH?

The focus groups/ co-design sessions will commence after some IRB training sessions on the weekend. You will be notified of the date and time prior each focus group. There will be 4-6 focus groups over the Spring/Summer period. You may be photographed, as well as video and audio recorded so we can focus on how you undertake IRB operating / maintenance scenarios.

As part of these focus groups, you may be asked to provide feedback on design prototypes that I produce as well as existing IRB designs. You will be asked to operate existing IRB equipment and observe/ critique developing designs produced by the primary researcher. I intend to photograph / record you using existing IRB equipment and critiquing developing designs. For example, I may wish to record:

1. The assembling and preparing IRB's and related equipment in the club house / storage / garage in preparation for use.

2. The transportation of IRB's and related equipment to the beach.

3. Performing on-water training activities, such as simulated rescues with existing IRB designs.

Your insights will be collected by me and will guide me in improving the design.

WHY AM I BEING INVITED TO THIS WORKSHOP?

You were chosen to participate in the study as you are an adult (over 18) female SLSNZ crew member, who regularly participates, is qualified in or is training to be qualified in IRB operation.

WHAT IS THE PURPOSE OF THIS RESEARCH?

We are interested in understanding why only 28% of female lifeguards are IRB operators and how we can engage/ empower SLS women to participate in this SLS activity. Our hunch for this research is that IRB equipment is not designed in consideration to females' physical capabilities. This research aims to identify and redesign ergonomic solution for areas of Inflatable Rescue Boat (IRB) operation that female participants find physically challenging. By working together collaboratively, we will design prototypes with the purpose of producing product/s that ergonomically cater for IRB operating women. The results of this research will also be published in a master's thesis.

WHAT ARE THE COSTS OF PARTICIPATING IN THIS RESEARCH?

There is no cost to you for participating in this research other than a maximum of 45 minutes your time after 4-6 IRB training sessions on particular weekends.

WHAT ARE THE BENEFITS?

I benefit from this research by using the results to complete our qualifications. I also get to practice our research skills and gain experience running a project like this.
In return, I hope that you will benefit from the opportunity to contribute towards the ergonomic improvement of IRB operation and its equipment for female lifeguards interested the SLS activity. Our research aims to improve the accessibility of IRB operation to SLS women through ergonomic design.

WHAT OPPORTUNITY DO I HAVE TO CONSIDER THIS INVITATION?

You have two weeks to consider this invitation, by contacting me via email using the details provided on page 1.

WHAT COMPENSATION IS AVAILABLE FOR INJURY OR NEGLIGENCE?

There is no compensation for this research, and you are undertaking the activity voluntarily. Participants involved are qualified lifeguards with first aid qualifications, and in the unlikely event of injury it can be effectively acted on by participants or instructors on hand with first aid training.

HOW WILL THESE DISCOMFORTS AND RISKS BE REDUCED?

To help you feel more comfortable sharing your thoughts and ideas, you are welcome to bring a family member or partner with you to participate in the workshops. You can also talk to me at any time during the workshops if you have questions or concerns about the workshop. You can leave the workshop at any time, for any reason, no questions asked. The researchers intend to create a safe space through these workshops, where participants can share opinions confidently and contribute to our vision of supporting SLS women to participate in IRB operation through design.

WHAT ARE THE DISCOMFORTS AND RISKS?

We don't expect there to be much discomfort or risk in this research. As you are lifeguards, we expect you to be confident in the water and when using existing IRB design/s. However, you may feel uncomfortable sharing your opinions about existing IRB designs and what needs improvement. You may feel uncomfortable sharing insight in a group situation or feel tired because of the training session before hand. At any time, if you do not wish to participate in any of the activities, you may withdraw from the research with no questions asked.

HOW DO I AGREE TO PARTICIPATE IN THIS RESEARCH?

You may agree to participate in this research by contacting me (Adam Jenkinson) via email using my contact details provided on page 1. Your participation in this research is voluntary (i.e. it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. You are able to withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible. Your decision to participate in the study will have no effect on your standing within the SLSNZ community or affiliated club. You will be given 2 weeks to reply/ consider participation in this research.

WILL I RECEIVE FEEDBACK ON THE RESULTS OF THIS RESEARCH?

Participants will be informed and receive a brief summary of research findings. If you would like to receive more information about the results of this research, you can let us know via the consent form and we will send the research documents

WHAT ARE THE LIKELY OUTPUTS OF THIS RESEARCH?

The outputs from this research include a design concept/ prototype that improves some aspect of IRB operation by the surf lifesaving community. The findings will contribute towards a master's thesis.

Consent and Release Form

For use when photographs, videos or other image recording is being used

Project title: ***Design for Female Participation in IRB operation***

Project Supervisor: ***Stephen Reay***

Researcher: ***Adam Jenkinson***

- ○ I have read and understood the information provided about this research project in the Information Sheet dated 17/8/2020.
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- ○ I understand that if I withdraw from the study then I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- ○ I permit the researcher | artist to use the photographs that are part of this project and/or any drawings from them and any other reproductions or adaptations from them, either complete or in part, alone or in conjunction with any wording and/or drawings solely and exclusively for (a) the researcher's | artist's portfolio; and (b) educational exhibition and examination purposes and related design works
- ○ I understand that the photographs will be used for academic purposes only and will not be published in any form outside of this project without my written permission.
- ○ I understand that any copyright material created by the photographic sessions is deemed to be owned by the researcher and that I do not own copyright of any of the photographs.
- ○ I understand that I will be unidentifiable in any photos or videos collected and my anonymity in the data collected will be maintained unless I have given consent to be identifiable (option below).
- ○ I wish to be identifiable in the research (please tick one): Yes○ No○
- ○ I agree to take part in this research.

Participant's signature: .....

Participant's name: .....

Participant's Contact Details (if appropriate):

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Date:

Approved by the Auckland University of Technology Ethics Committee on type the date on which the final approval was granted AUTEC Reference number type the AUTEC reference number

Note: The Participant should retain a copy of this form.

Consent Form

For use when interviews are involved.

Project title: ***Design for Female Participation in IRB operation***

Project Supervisor: ***Stephen Reay***

Researcher: ***Adam Jenkinson***

- ○ I have read and understood the information provided about this research project in the Information Sheet dated 17/8/2020
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that notes will be taken during the interviews and that they will also be audio-taped and transcribed.
- ○ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- ○ I understand that if I withdraw from the study then I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- ○ I agree to take part in this research.
- ○ I understand that I will be unidentifiable in any photos or videos collected and my anonymity in the data collected will be maintained unless I have given consent to be identifiable (option below).
- ○ I wish to be identifiable in the research (please tick one): Yes○ No○
- ○ I wish to receive a summary of the research findings (please tick one): Yes○ No○
- ○ I agree to be contacted too provide feedback on future design concepts (please tick one): Yes○ No○

Participant's signature: .....

Participant's name: .....

Participant's Contact Details (if appropriate):

.....

.....

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Date:

Approved by the Auckland University of Technology Ethics Committee on type the date on which the final approval was granted AUTEC Reference number type the AUTEC reference number

Note: The Participant should retain a copy of this form.

Consent Form

For use when focus groups are involved.

Project title: ***Design for Female Participation in IRB operation***

Project Supervisor: ***Stephen Reay***

Researcher: ***Adam Jenkinson***

- ○ I have read and understood the information provided about this research project in the Information Sheet dated 17/8/2020.
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that identity of my fellow participants and our discussions in the focus group is confidential to the group and I agree to keep this information confidential.
- ○ I understand that notes will be taken during the focus group and that it will also be audio-taped and transcribed.
- ○ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- ○ I understand that if I withdraw from the study then, while it may not be possible to destroy all records of the focus group discussion of which I was part, I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- ○ I agree to take part in this research.
- ○ I understand that I will be unidentifiable in any photos or videos collected and my anonymity in the data collected will be maintained unless I have given consent to be identifiable (option below).
- ○ I wish to be identifiable in the research (please tick one): Yes○ No○
- ○ I wish to receive a summary of the research findings (please tick one): Yes○ No○
- ○ I agree to be contacted to participate in future focus groups/ co-design workshops: Yes○ No○

Participant's signature: .....

Participant's name: .....

Participant's Contact Details (if appropriate):

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Date:

Approved by the Auckland University of Technology Ethics Committee on ***type the date on which the final approval was granted*** ***AUTEC Reference number*** ***type the AUTEC reference number***

Note: The Participant should retain a copy of this form.

EXPERT INTERVIEW AND INDICATIVE QUESTIONS PROTOCOL

Expert interview protocols will be conducted before co-design workshops commence. Participants (interviewees) will be expert surf lifesaving women who have experience using the IRB rescue boat and IRB trainees. Interviews will take place at the site of boat and equipment testing (the participants local clubs). Information will be recorded in written note form by the researcher and may be audio recorded with the participants written consent. This is a non-threatening form of documentation. It is suited to the nature of the research, as the information gathered will be relatively simple. Questions will be open ended and related to the expert's area of expertise as relevant to the research topics. For example:

- Why did you want to be involved in IRB operation?
- What do you enjoy about IRB activities?
- What IRB activities don't you like?
- Can you tell us some of the experiences you have had where you have found it difficult or challenging to perform IRB operating duties?
- How might IRB operation and the equipment used within activities better cater to women?
- What makes rescues/racing dangerous or risky (for the boat crew)?

FOCUS GROUP PROTOCOL

Focus groups/Workshops will involve undertaking activities as part of the normal IRB operating procedures. Normal SLSNZ safety protocols are undertaken for this type of event. This includes equipment, training, roles and responsibilities on board, weather planning and land-based support crew. These focus groups/workshops will arrange the IRB operating procedures into 3 general categories of activities as follows:

1. Assembling and preparing IRB's and related equipment in the club house/ storage garage in preparation for use.
2. Transportation of IRB's and related equipment to the beach.
3. Performing on water training activities, such as simulated rescues.

The collaborative nature of co-design workshops means a portion of the data will be analysed with the participants during the process, through answering questions around the experience of generating data and what they thought about it. Feedback will be sought on prototypes developed as part of the research. It is anticipated that prototypes will be product concepts or ideas that help with more physical activities such as moving heavy equipment (e.g. motors and boats) or starting motors.

Indicative questions include the following:

1. How do you feel about the interaction with this aspect of IRB operation?
2. What about the design was comfortable/ easier for you to use compared to the existing design?
3. What about the design is difficult to use?
4. How do you think this design might impact SLS women's' participation in IRB operation?

Each session will also be video-recorded, and the recordings will be re-watched by the researcher for further analysis to be made.
Insights, comments and thoughts will be compiled, reviewed, and then summarised in a document which will outline the key insights and findings. This collected data will help determine future design direction and the form/ function of the next iteration. Data will be analysed with participants as part of the natural flow of the workshops, to involve participants in the codesign process as much as possible.

OBSERVATIONS PROTOCOL

Participants
Participants observed are those involved in the co-design workshops. This will be qualified surf lifesavers whom consent to participate in the study. All will be capable and experienced in operating inflatable rescue boats.

First Point of Contact
Prior to each observation session, the researcher will inform the participants of the time, place, and duration of their intended observation and gain approval, through consent form.

During Observation
The researcher will not interact with participants but will position him/herself in a public area so that they are able to view a wide range of activity. While observing participants, the researcher will uphold a high level of professional conduct. Because the researcher's movements within the space may influence the movements and interactions of participants, the researcher will maintain an awareness of this and remain discrete in her movements and actions as much as possible.

Duration
Observations will take place over the co-design workshops conducted after IRB operating training sessions.
Observations will occur for 30 minutes during the co-design workshops. This is followed with a small 15-minute discussion/ reflection about existing and developing design/s.

Data Recording
This information will be captured by photograph and video recording. Participants will give consent and allow this method of data collection to happen, knowing they will not be identifiable in any publication/ documentation that may occur, and all identifiable traits of the participants will be censored.

RESEARCHER SAFETY PROTOCOL

Design for Female Participation in Inflatable Rescue Boat (IRB) Operation
Researcher Safety Protocol

The researcher is undertaking these trials as part of the normal IRB operating procedures. Normal SLSNZ safety protocols are undertaken for this type of event. This includes equipment, training, roles and responsibilities on board, weather planning and land based support crew.

There is no additional safety protocol required because of the research being undertaken.